The
Geographical Journal.

No. 2. FEBRUARY, 1901. Vol. XVII.

The Death of the Queen.

It is only possible, at this time, to place on record the profound sorrow of the Council and Fellows of the Royal Geographical Society, at the loss which the Empire and the world have sustained in the death of Her Most Gracious Majesty Queen Victoria, Empress of India. The Queen did the Society the great honour of becoming its Patron when she ascended the throne, and of continuing the Royal Bounty of her predecessor, which enables the Society to award each year the two Royal Medals. Another opportunity will be taken of referring to the great qualities which will give Her late Majesty a supreme place in history, and to the almost unparalleled advances in Geographical Discovery and Geographical Science which have been made during her long reign. Here it must suffice for the Society to join in the universal expression of grief at the loss which the Empire has sustained; and to wish that Her Successor, King Edward VII., Emperor of India, may long be spared to us.

CLEMENTS R. MARKHAM,
President R.G.S.

EXPLORATIONS IN MAROTSELAND AND NEIGHBOURING REGIONS.*

By Major A. ST. HILL GIBBONS, 3rd East Yorkshire Regiment.

BEFORE proceeding to give a general account of the expedition I had the privilege of leading into Africa two and a half years ago, I wish to say a few words on the objects for which it was organized. Briefly, these objects were to complete the work I commenced in 1895, 1896, as described in the paper I read before this Society in January, 1897.

Lewanika, the paramount chief of many tribes residing in the upper Zambezi territories, rules over a vast country, with an area over twice the size of Great Britain, roughly extending, as I am now in a position to assert, from the Congo-Zambezi watershed in the north, to 18° S. lat. in the south, and from the Kwito in the west, to the Kafukwe in the east. Under the 1891 convention with Portugal the Anglo-Portuguese frontier is synonymous with Lewanika's western boundary. This was the arrangement by which Lewanika petitioned the Great White Queen to assume a protectorate over his dominions, and in accepting the responsibility Great Britain undertook to preserve the chief's territory intact. But so little was known either of the political or geographical conditions of this country, that the supposed frontier has been continually shifted during the past decade between the Zambezi and some 200 or 300 miles westwards. Livingstone, as you well know, travelled up the Zambezi as far as Nanakandundu, and thence westward to Loanda half a century ago. To his work little has been added beyond the result of Serpa Pinta's journey along the old slave route to Lialui—an east and west road to Benguella, and that of Capello and Ivens on the same route, and thence up the Kabompo. Missionaries and others have passed up and down the river since, but the great bulk of the country has remained a *terra incognita*.

The objects, then, of the expedition were—

(1) To determine the geographical limits and tribal distribution of Lewanika's empire, and thus I trust to so far substitute fact for conjecture as to place sufficient material at the disposal of H.M.'s Government, and that of His Majesty the King of Portugal, to simplify negotiations between our old friend and ally and ourselves, and thus facilitate an early and friendly settlement agreeable to both countries.

(2) To supply what may be called a skeleton map of Marotseland by travelling the country in all directions.

(3) To study its resources and commercial possibilities, and

---

* Read at the Royal Geographical Society, December 10, 1900. Sketch-map, p. 126. Map, p. 224.

MAJOR GIBBONS' MAP.

The detailed map for Major Gibbons' paper will be published, it is hoped, with the March number of the "Journal;" in binding, it should be placed at the end of the present number.

(4) To ascertain how far the Zambezi and her affluents can be utilized as practical waterways.

I disclaim the Cape to Cairo globe-trotting objects attributed to us. They grew out of my statement that when our work was finished we would return by the east, the west, or the north, adopting the last route for choice as offering greater interest. I have always felt that long, straight routes through Africa ceased to be of anything more than very ordinary value when once the main features of the continent had been determined; and that to turn a somewhat hard and uncertain profession to its best account, the latter day explorer had best select a circumscribed district and work it thoroughly; 5000 miles within such an area is immeasurably more valuable than the most imposing line from coast to coast. If, therefore, the expedition deserves any credit for its work in Africa, we claim it not for the lines we have made from Capetown to Cairo and from Chinde to Benguella, but for the more serious and useful work we have accomplished in Marotseland.

To carry out the objects I had at heart, this Society and other bodies generously placed at my disposal the means to pay the expenses of myself and one other. I then conceived the idea of increasing the personnel of the expedition, provided I could find men who were not only willing to make a contribution calculated on covering the extra expense of taking them, but who would sign a well-defined agreement and place themselves absolutely under my leadership—a dangerous experiment, but one which, I am proud to say, in this case acted admirably; for never was leader more loyally and energetically supported, nor an expedition so free from those bickerings and dissensions which have so often impeded good work in Africa.

In African travel the principal difficulty to be considered is the method by which the necessary supplies are to be transported. I had previously experienced the stupidity and pig-headedness of the ox, the ass, and the native porter; but the greatest of these is the porter, and —owing to the tsetse curse—he alone was available of the three for work in the objective country. To move so large an expedition in this way, with the extra goods required to pay and sustain them, would have necessitated at least 600 carriers, to say nothing of askaris to keep them together and prevent desertion, so I decided to depart from the usual lines and utilize the waterways which nature has placed at our disposal. Thus we landed at the Chinde estuary of the Zambezi on July 16, 1898, with two aluminium launches, 26 feet long with a 6 feet 6 inch beam, and a barge 22 feet $3\frac{1}{2}$ inches long. These were built in interchangeable sections, so that the steamers could be lengthened, or damaged sections replaced, at the expense of the barge. Contrary to advice I adopted what is known as the Hodgett's principle of hull construction. With their three modified keels and catenarian curves, the launches shared all the advantages of light draught with the flat-bottomed boat,

and at the same time by reason of the firm grip they had on the water, seem to me to answer the helm even better, and sail closer to the wind, than the usual single keel boat. I have been witness to the unwieldiness of flat-bottomed steamers in eccentric currents on the Zambezi and the Nile, and I feel sure Government and trading companies will do well to take advantage of my experience in this matter.

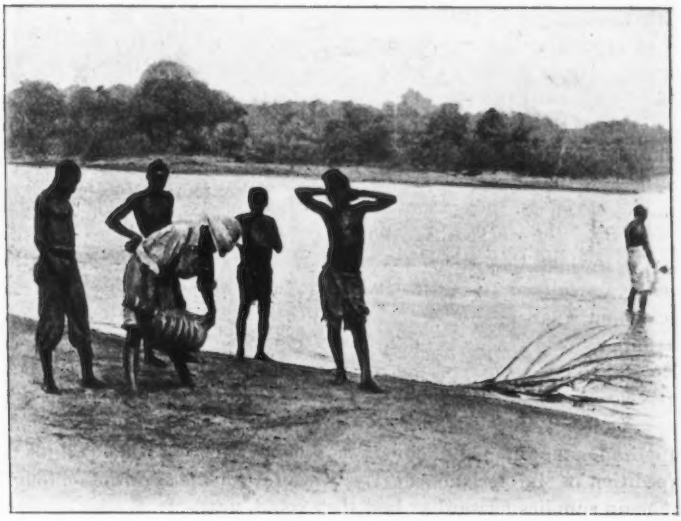
On the 18th we left Chinde in the *Centipede*, chartered from Sharrer's Zambezi Traffic Company, to take us bag and baggage to the foot of the Kebrabasa Rapids. A land journey of 70 miles is necessary to clear this bar to navigation, and I was anxious to save time and the extra work of constructing and disjointing the flotilla for the passage of the lower river. With me were Captain Quicke, King's Dragoon Guards; Captain Stevenson-Hamilton, 6th Inniskilling Dragoons; Mr. L. C. Weller, of Trinity Hall, Cambridge, who had an engineering training, and, fortunately for the expedition, cut short his University career in order to be one of us; Captain Boyd Alexander, 7th Rifle Brigade, an energetic ornithologist, who was assisted by Mr. Ramm, a professional skinner; and Mr. Theo. Muller, an accomplished linguist of considerable experience with natives who travelled from Capetown *viâ* Mashonaland, to join the expedition at Tete.

The Lower Zambezi is too well known to call for more than a very few remarks from me. Save for the picturesque Lupata Gorge through which the Zambezi flows deep and swift, the lower river, at the time we passed up it, is merely a broad expanse of sand, three to five miles wide, with low, reed-fringed banks, and intersected by numerous shallow streams. So shallow are these streams, that the *Centipede*, with a draught of but 28 inches, took three weeks instead of six days to reach Tete. You can, therefore, easily calculate the number of hours we spent on sandbanks, and the amount of unnecessary towing and digging, for which a certain aluminium company was responsible, in trying to palm off an inferior article for the construction of the boats, and thus necessitating a six weeks' delay. I calculate that this wretched company cost us nearly three months' delay and a power of hard work in our passage to the Victoria falls, by compelling us to do the journey at the most difficult time of year.

On August 13 we reached the confluence of the Mesenangwe river, at the lower entrance of the rocky gorge through which the river surges in an unnavigable torrent, known as the Kebrabasa Rapids. I was astonished to find so little water in the river here. In 1895 I travelled the Upper Zambezi at the same time of year, and have no hesitation in saying that the Zambezi carries more water below its confluence with the Kwando or Linyante river during the last two or three months of the dry season, than it does here, nearly 1000 miles down stream. This is, no doubt, due to the fact that, with the exception of the Kafukwe, no affluent of the Middle river supplies more than

an inappreciable quantity of water in the dry season, while, on the other hand, the soakage and evaporation in thirsty Africa must be considerable.

Kebrabasa, "the place where service ceases," is the first bar to navigation from the sea. Livingstone reached there on November 9, 1858, in his steamer the *Ma-Robert*—the herald of steam power and navigation on the Lower Zambezi. The father of modern explorers made gallant attempts to pass this barrier, but nature won the day. I will not waste time by describing this rocky gorge. To do so would be merely to repeat Livingstone. I have passed over much of his work at one time and another, and have never discovered in his discriptions the



PURCHASING CORN, MIDDLE ZAMBEZI.

smallest tendency to over estimate or exaggerate. These rapids remain as a lasting monument to the moral strength of the man who attempted and repeated the attempt to force a passage through them.

It was not until September 21 that the whole expedition was encamped at Chikoa, after 5½ weeks of hard work in readjusting the loads and rushing about in various directions between Mesenangwe and Chikoa, to secure the 457 porters necessary to convey the steamers and loads over one of the most difficult countries I have passed through. The services of Mr. Muller were of special value to the expedition at this juncture, not only did his indomitable energy relieve me personally

of much hard work, but his knowledge of Portuguese neutralized the inherited inconvenience consequent on the indiscreet conduct of the gentlemen of Babel. The local magnate at Chikoa was a coloured Portuguese known as Senhor Ignatio de Jesus Xavier, an honorary lieutenant-colonel in the Portuguese army. This gentleman had a widespread reputation for placing difficulties in the way of English travellers, and of being especially grasping in his dealings. Contrary to expectation, I am glad to say we suffered in neither direction at his hands, and he responded promptly to every call made on him. I am afraid I must confess, from what I saw of two traders who tried to pass Chikoa but failed, that Englishmen sometimes create the difficulties from which they suffer. It transpired that our friend Senhor Jesus was with Livingstone in 1858, and he openly confessed that he was glad to be of service to the expedition which was to continue the work of his former master. Possibly a more curious coincidence connecting the *Ma-Robert* with our little steamer *Constance* is, that the former first reached her goal at the foot of the Kebrabasa on the very day that the more humble owner of the *Constance*—the pioneer steamer above these rapids—first saw the light of day.

The steamers, once together, were loaded up, and made a start up-stream. We worked hard for some days, but made little progress. It was evident that the boats were overloaded, in other words, that their practical and theoretical capacity were not synonymous. I soon decided on what, in my own mind, was the only wise course to adopt, but for obvious reasons kept my thoughts to myself, until one day my officers helped me out of the difficulty by making the suggestion I wished for. They had unanimously decided that I had best take Captains Quicke and Hamilton on in one steamer with Mr. Weller, and supplies for the three of us for six months, and get on to the work of the expedition in Marotseland as early as possible, while the others brought the main supplies forward as best they could, until Mr. Weller returned to help them with the empty steamer. I at once acquiesced, arranging that Mr. Muller, after a hurried visit to Tete, with Captain Alexander and Ramm, should take everything to Zumbo in two journeys, and thence to the Kafukwe confluence. Mr. Weller would then take command and steam up the Kafukwe, establishing a base camp as far up the river as possible, open communications with us in the west, and make a series of short expeditions alternately with Mr. Muller and Captain Alexander until our arrival, on the completion of the work for which we entered Africa. We would then carry to the Luapula and follow the lakes route. A trial showed that the steamer carried $4\frac{1}{2}$ tons admirably, so in two days we steamed up river under more favourable circumstances.

Between Chikoa and Zumbo the Zambezi varies between a single deep stream and a shallow sandy bed, similar to but much narrower

than what I have already described as existing in the lower river, the latter feature predominating. There are but two rapids in this stretch—the Chansenga and the Kakolore. Zumbo was reached on October 21, and the next day we steamed into British territory. I take this opportunity of publicly expressing my deep sense of gratitude to the Portuguese for their unvarying courtesy and kindness during our passage through their territory. Officers and civilians, from the Governor-General downwards, did everything in their power to further our interests and facilitate our undertaking. From Zumbo the scenery becomes very fine for some 35 miles. The river flows in a deep clear

BATONGA WATCHING THE PROGRESS OF THE *CONSTANCE*.

stream through a well-wooded, mountainous district, while a fringe of dark heavily-leafed trees, beyond the light-coloured sand lining the water's edge, imparts a pleasing variety to the picture. On the third day from Zumbo we entered the gorge shown as "Kariva" on the maps. This same gorge is known as Lupata, in the Zumbo district. Both are native words, signifying "gorge," in different dialects—Kariva being simply another pronunciation of Kariba, the name by which the third gorge—that above the Kafukwe confluence—is known. That two of these should be known by the same name is inconvenient, even though the "b" in the one case be exchanged for a "v" in the other. It seems to me that the undeniably sound rule of adopting native names is best partially departed from in this instance, so I have added the name "Livingstone" to "Kariva" on my map, and submit that

geographers would do well to adopt the suggestion, and thereby not only avoid inevitable confusion in the future, but serve the second purpose of associating the name of the great explorer with one of the grandest pieces of scenery on the most beautiful of the four great rivers of Africa—that river whose mysteries he did so much to unravel.

Near the eastern entrance of this gorge we faced the most difficult rapid as yet met with. With a fall of 3 feet in 30 the river rushes between rocky banks only 40 yards apart and then flows in a seething current for some 250 yards. With the help of a backwater we reached a small bay immediately below the rapids. In the first attempt—using of course the tow-rope—the bows of the boat got wedged between two hidden rocks. Lowering her down, the goods were off-loaded, and we tried again. This time the rope was forced from the boys' hands, and we were swished down stream for some 200 yards before we could get into quieter water. Next time the rope, refusing the strain, broke, and away we went once more. The fourth attempt proved successful after a long, hard pull. So great was the rush of water at the critical moment that, while the bows were all but submerged, the keel immediately beyond was almost laid bare. Four years earlier a Portuguese officer lost his life in these rapids. While being towed through, the rope broke, the boat capsized in the rushing water below, and he, with part of his crew, was drowned. Once in the gorge, we steamed through a deep slack stream confined within narrow limits by precipitous wooded mountains. As the river widened things changed for the worse. Three days of much tow-rope and little progress culminated in an accident, which promised at one time to be serious. Thrice the rope was forced out of the boys' hands in attempting to pass a rapid, and the last time became entangled in the screw. We had sprung a serious leak after a succession of violent bumps on the rocky bed, and with our screw helpless bade fair to go down in deep water. The rope was disentangled none too soon, and we made a stony island in a sinking condition. Much damage was done to provisions, and it took Mr. Weller three days of work from sunrise to sunset to repair damages.

As the Kafukwe is approached the river widens considerably, and is free from rocks. The banks of yellow clay, intermixed with gravel, are constantly being eaten into by the action of the water. As the land slips trees fall with it and are distributed about the river-bed in all directions. The Kafukwe enters the parent river in a quiet deep stream about 200 yards wide with well-wooded banks. It is navigable for some 20 miles, when there must be a rise of about 1000 feet in little over 15 miles. Captain Hamilton, on his return from the seat of war, will be able to tell us something of the lower reaches of this river, as he followed its course, so far as possible, on his return journey to the east coast.

To the Sanyate confluence in the Kariba Gorge the river is easy of navigation, but here the Nakabila Rapids offer many dangerous obstacles at this season. Pointed rocks rise above the water surface, and there is evidence of others only a few inches below. I decided to carry over land, as the rope was not long enough to tow with safety from the high walls of rock confining the river. The local natives undertook to convey the steamer and goods to a place 3 miles up stream, but finding the carriage of the boiler over the huge blocks of basalt no easy task, they struck and departed.

Our Portuguese friends had warned us time after time that the boys would certainly desert before they got beyond their ken. The usual scares had been disseminated among them—such as a small-pox epidemic in front, while they were credibly informed that the natives up the river put poison in the food they sold, and that the people further on were cannibals. Consequently I was more annoyed than surprised when one fine morning all but five were missing. Wearing my revolver for the first time since my first arrival in Africa, ten years ago, I hurried off in pursuit with Captain Quicke and Mr. Weller till we reached a native settlement 2 miles up stream. The first village knew nothing; the second had seen them pass. I soon arranged—for a blanket a piece—with two guides to follow up the runaways, and leaving my companions, set off at a double, with my Zulu servant carrying a Mauser. After 3 miles of this I met one boy, apparently returning. He fell on his knees, imploring me to spare his life. As I had no intention of taking it, I magnanimously granted his request on condition he led me to his fellows. A little further on I caught them in a hollow, and was in their midst before they suspected my approach. Throwing down their bundles they made off in all directions, but a threat to fire brought them to a standstill. In a short time they were making their return journey, the Zulu in front, myself behind. For the next three days they were never out of sight of a revolver night or day, and were treated with all the harshness their conduct merited, until the steamer was once more floating and loaded. Henceforward these boys behaved admirably, and several occasions later almost surprised me by their devotion. I am convinced that had they been merely lectured and told not to do it again, they would have repeated the attempt within a week.

The next 100 miles were pleasant travelling; banks were high and water deep. This stretch is much more thickly populated than any other part of the Middle river, though quite nine villages out of ten were on the north bank; probably the Matabile raids of the past had driven the people across the river for better protection. The interest these natives—the Batonga—took in the steamer was amusing; crowds, mainly composed of women heavily decked in beads, would run along the banks dancing and singing and chattering. It was comical to note

the effect of the whistle; every other sound ceased in an instant, and they went for all they were worth. And now came the last and hardest 25 miles of our river journey. It began with the Molele rapids, then the Sepanga, and after these several others—about twenty in number. On one occasion, when the steamer was held immediately aft the engines by a pointed rock, just as we were clearing the worst rapids we negotiated, and, in spite of the boys on the rope, was gradually being forced round broadside to the stream, we were for some minutes in a most awkward position. Never before or since in the whole course of my African experience have I felt the odds against me as I did on this occasion. I have no time to describe the incident, but by a supreme effort on the part of both white men and black, the boat, goods, and some of ourselves were saved from certain destruction.

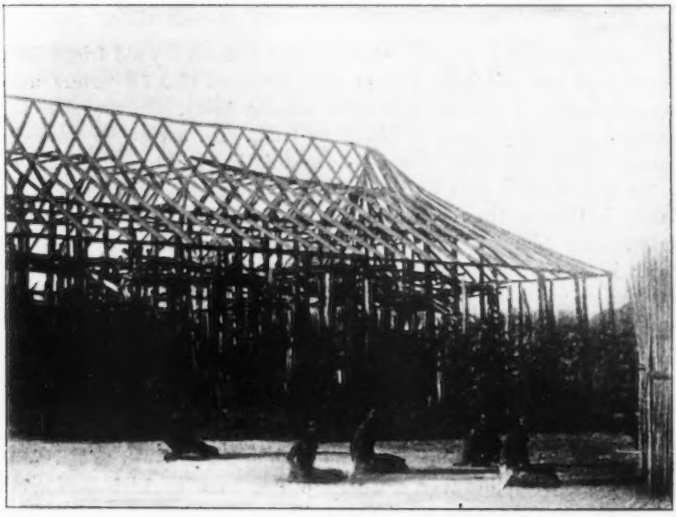
Finally, after unceasing work, we found ourselves 2 miles beyond the Guay confluence. The last 8 miles were through a most dismal gorge. The river, swift and narrow, is broken every few hundred yards by rocky barriers. It would be hard to exaggerate the almost lifeless dreariness of this gorge, and as it has not been described before, I will endeavour to do so. The river reflects the grey-black colouring of perpendicular walls of basalt, standing only 60 to 100 feet apart. These in turn impart an inky hue to a water surface disturbed by conflicting currents and whirling eddies. Above these, huge flat-sided boulders are strewn about in confused disorder. In travelling over them, as one or the other of us had to do on several occasions, the maximum pace was one mile an hour. The rocks are surmounted by precipitous hills, 7 or 8 hundred feet high, covered with forest and tangled undergrowth. Nothing is to be heard above the dull continuous murmur of the water. I know no place in this world which so reminds me of what some of us are told to expect in the next, so named it the Devil's Gorge, since even those few natives we met with immediately beyond its precincts insisted that they only had names for some of the rapids, but none for the gorge itself.

A cursory examination of the river ahead convinced me that we had tested the navigability of the middle Zambezi to the full, and that a further advance by water could serve no useful purpose, for I knew that Wankie's—more properly called Zonki's—could not be more than a few miles in front, and that when once there we were within touch of Marotseland. To carry our goods, with the few boys at our disposal, in six or seven relays, until we could find the requisite number of porters, seemed to me preferable to a return to the nearest village, 35 miles down stream, without any certainty of inducing the natives to carry our loads. Therefore, Captain Hamilton and myself, with fourteen boys, left the *Constance* moored to a ledge of rock on the north bank the following afternoon. In two days we had travelled 7 miles, and were much relieved to see native cultivation on the opposite bank,

for the boys were foodless, and, but for a timely shot at a baboon, would have had nothing to eat since leaving the steamer.

We soon made friends with an old man who, with his wife and one son, proved to be the sole occupant of the village. He undertook to guide Captain Hamilton by an easier route south of the river. This necessitated the crossing of the steamer. The fact that she was carried over a mile down stream before she could make the opposite bank, about 100 feet away, gives an idea of the swiftness and treacherous character of the current in the Devil's Gorge.

On December 29 we bade farewell and God-speed to Mr. Weller and the little steamer which had been our home for so long. She had had



NATIVE-MADE HOUSE AT LIALUI FOR LEWANIKA'S SISTER.

a rough time of it, but, thanks to Mr. Weller's skill, was still seaworthy. She had been beached four times—three with holes in hull, and once with a bent shaft—in her passage up the river. However, I foresaw no difficulties in her return journey, for the water had already risen considerably, and every rapid had at least one deep stream through which she could pass without danger.

About 2 miles above our camp the river rushes over a rocky bank in a cataract, known by the local natives as Sichiwene. The water comes over in two broken falls within a few yards of one another, dropping about 12 feet in all.

By January 1, 1899, everything was ready for a further advance.

Makwa Zonki's village on the river—his own town being on the Guay —was only a short day's march, so I started thither with Captain Quicke and six boys, hoping to procure porters. We were unsuccessful, so the next day I crossed the river with the intention of making forced marches to Sesheke, a short 200 miles west, arranging that Captains Quicke and Hamilton should remain with the goods till I could procure boys to bring everything forward. The path for the first two days was up a rough ascent of nearly 2000 feet. The invigorating and stimulating effect of such a change upon the traveller is most marked, and travel becomes a pleasure instead of a toil. Such a fact seems to me to demonstrate the important part the uplands of Africa are destined to play in the future development of the empire. When once on the plateau, my path took me over gentle sandy undulations, covered with open forest.

In twelve days I was at Sesheke, where I found my old friend Letia, Lewanika's son and heir, who at once arranged that 70 porters, under two chiefs, should proceed to Makwa without delay. In the mean time I made a hurried journey to Lialui by land, with a view to arranging matters with Lewanika. I was able by this journey to make additions to the map of this part of the country, which was published by the Society in 1897, as the result of my work during the two previous years. On reaching Lialui I had the disappointment of missing my friend, Major R. T. Coryndon, who, some months earlier, had been appointed first British agent of Marotseland. On hearing of my arrival, he very kindly made preliminary arrangements with Lewanika on my behalf, and hurried down to Sesheke to meet me. Thus the chief was prepared for my suggestions; his native mind had been allowed time to work; and he at once fell in with my plans. He agreed to supply three caravans. With one I proposed to travel along the western boundaries of his dominions, thence by the Congo-Zambezi watershed to the source of the latter river, and then trace its course back to Lialui. Captain Quicke would go west to the Kwando-Kubangui confluence, follow the former to its source, and return to Lialui by the Lungwebungu and Zambezi; while Captain Hamilton, after following the Kwando to the Kubangui, would make for Lialui by a route south of Captain Quicke's. While in Burotse it rained incessantly. During the first eleven days of my visit the rain-gauge registered 13 inches, or nearly half the annual rainfall of London. Lewanika lent me some of his own paddlers for my return journey to Sesheke. They were a splendid lot of fellows, and paddled their canoes at the rate of 70 miles a day. We travelled with the stream, of course, but half the distance would be good for most natives.

I was in Sesheke again on February 23. Two days later Major Coryndon arrived, and, nothing having been heard of Captains Quicke and Hamilton, we went together down stream to Kazungula. There

we found Captain Hamilton, who had tramped in the day before with one boy. He reported that their journey had proved a very rough experience. Heavy rains had fallen incessantly, and the rivers were consequently in flood. The porters, who had suffered much from hunger while passing through the unpopulated country during the first half of the march, had dispersed among the villages some three days' journey off, and had been away four days at the time he left. Both he and Captain Quicke, in spite of such adverse circumstances, had enjoyed excellent health. I immediately despatched Jack—an interpreter Lewanika had placed at my disposal—with a letter to Captain Quicke, asking him to come in to Kazungula, and not attempt the land journey to Sesheke, as all the rivers were in flood. However, he was already within a day of Sesheke when he received the letter, and on receipt of this news we followed him thither by canoe.

At Sesheke I received a letter which had found its way across country from the Kafukwe, in which Mr. Weller wrote that on his arrival there he found Captain Alexander. One passage caused us much grief. "Muller," it ran, "was taken ill with dysentery at Tete, but did his best to push on, and was last heard of in a dying condition at Kashombe." This was bad news indeed, though, while fearing the worst, we hoped for the best. The letter also stated that Captain Alexander had mentioned his intention of returning home, and that he himself was very ill, but would do everything in his power to bring further supplies forward.

Before proceeding to describe our travels in Marotseland, I wish to correct a statement I made in a paper I read before this Society four years ago. I stated then, as the result of information I had received, that Marotse, Borotse, and Barotse signify the people, the country, and the individual. The first is correct, so is the second, except that a short "u" is best substituted for the "o" in the prefix, but the last is quite wrong. During my last visit to the country, I spared no pains in determining the correct spelling of the tribal names of these people and their subject tribes, and have no hesitation in affirming the correctness of Marotse and Burotse as applying to people and country. Popular usage would seem to insist on the Anglicizing of the names of all native states in South Africa by adding "land" to the native name. Thus, in this case, Burotse falls into disuse and becomes Marotseland.

The rains were practically over when, on March 22, I left Sesheke with Captain Hamilton for the west. We crossed the Zambezi and traversed the flat, almost waterless country lying between the Kwando or Linyante and the parent river, reaching Mamili, an important village situated near the former in 18° 3′ 30″ S. Lat., four days later. In the chief Mamili I found a most intelligent and interesting old man, from whom I gleaned much information bearing on the people and their

history. It was he who carried Livingstone's message to Sebitwane, apprising the Makololo king of his approach, and asking leave to enter the country, and who returned with a message of welcome. In talking about Livingstone, the old man told me that Sekeletu—who succeeded his father Sebitwane—when the Doctor left the country after his second visit, lent him the services of a number of Matoka, Matotela, Masubia, and Marotse slaves under the Makololo chief, Sekwebu, but that they had never returned, and were all dead. He was very interested to hear that, so far from being dead, these slaves had settled in British Central Africa, had taken to themselves wives, and become quite a large tribe, but that Sekwebu, after going mad, jumped into the sea and was drowned. It may interest ethnologists to hear that there is not a drop of Makololo blood in the so-called Makololo of British Central Africa. Mamili said that he had witnessed Livingstone's departure, and insisted that Sekwebu was the only Makololo among them. He further confirmed a statement I made four years ago to the effect that the lower reaches of the Kwando have never been known by the natives as Chobe, but that the name of the old capital, Linyante, had been applied to the river since its foundation. He had lived on the river all his life—at least seventy years—and had been chief of the whole district for thirty-five years.

We left old Mamili, after having photographed him and his wives —he suffered from twenty-five—on March 24. We had experienced the greatest hospitality during our ten days' visit. A hut 30 feet long had been built and enclosed in a circular courtyard of 60 feet diameter. The grass and bush had been cleared for some distance round, and a wide road been cut to the village. On our arrival he presented an ox, meal, and vegetables, while twice daily fresh milk was brought for our consumption.

I had asked Lewanika to give me one chief or headman only, but he insisted on sending eight—five to travel with me, and three with Captain Hamilton. This, of course, was his way of paying a compliment, but in doing so he gave me a following of over a hundred, whereas I have always found that for comfort and pace twenty is a good maximum. The journey for the first few days was interesting only from a historical standpoint. I was shown the battle-field on which the conquering Makololo defeated Bololo, the Marotse general, eighty years ago, and thereby gained an ascendancy over the people of the country; also the tree under which Sebitwane died in Livingstone's presence thirty years later, and the confines of the old town of Linyante, which covered a considerable area in those days, but is now replaced by three small hamlets.

I crossed the Kwando in 18° 7′ 30″ S. lat., on the same day bidding adieu to Captain Hamilton, who followed the course of the river northwards. We all three hoped to "rendezvous" at the Kubangui-Kwando confluence six weeks later.

Lewanika had told me of a stream, called Mag'wekwana—with a click after the "g"—which connects the Okavango with the Kwando after the rains. I travelled south till I struck this, and then followed its course westwards. For the first few days the bed was clearly cut, and about 100 yards wide, but at that time perfectly dry. I wondered whether this was not the original bed of the Okavango, and whether that river had not at one time been part of the Zambezi system. On April 14, the bed having become much wider and less well-defined, we saw in front numerous water-fowl flitting about. My chiefs grunted their disapprobation on seeing this, informed me that the water was coming, and a short distance further we were ankle deep. The overflow from

GROUP OF MALUNDA NEAR ZAMBEZI SOURCE.

the Okavango had commenced, and since the definite bed of the river had now disappeared, the whole country to right and left was inundated. For three and a half days I had to wade knee-deep, camping wherever I could find a comparatively dry spot. I was just a week too late, but my guides assured me that another week would have meant water to the shoulder; in fact, in one or two places it was so already. The natives told me that the overflow continued for a couple of months, when the inundations gradually drained off into the Kwando, and the land became dry once more. The overflow occurs in about 19° S. lat., and here I found dry ground near a deserted village, called Bietcha, which had been the scene of a tragedy.

Five days earlier two natives came to my camp, and implored me to give my aid in restoring their wives and goats, which had been appropriated by others under the following circumstances. A fellow-villager, named Macumbe, had been away on a journey, leaving his wife behind him. On his return he found that Niru, of Sejala, an adjoining district, had exerted his charms, and taken her to wife. An argument followed, and the people of Bietcha decided, on the woman refusing to return to her lawful husband, that she need not do so, but that she must leave Niru also. They then went to Sejala to claim her, but Niru refused to give her up. A few nights later he collected a following from his own and two neighbouring districts, surprised Bietcha, broke Macumbe's arm, cut off both feet, and shot him. A brother running to the rescue, was stabbed in the back and killed. On this the men of Bietcha fled, and Niru and Co. appropriated the women and goats. I directed the two men to accompany my caravan, and promised to do what I could for them. In six days I had released the captive ladies, some thirty in all, and handed them over to their devoted husbands; nor was I the recipient of a single word of thanks from man or woman.

The next day I was skirting the inundated plain through which the Okavango flows. This is several miles wide, and is bounded by high, dark yellow sandy undulations, growing thorny acacias and entangled undergrowth. As there was no path through this, I found constant wading preferable to working a passage through the thorns.

Two distinct tribes occupy this district. Maiye, whose country extends southwards, and Mampukushu, who had left their own country, twelve days up stream, because their chief, Lebebe, insisted on selling their children to the Mambare slave dealers from the West Coast. The Maiye resemble the South African native in type, are a shade lighter in colour, and wear their hair short. Their half-ball-shaped huts are formed by tying mats over a wooden framework. The Mampukushu are quite black, and live in cone-shaped, grass-thatched huts. The men cut their front hair short, while the remainder is long, and falls back in ringlets. Their women allow their hair to grow long, and work in bark thread, which hangs down to below the back, giving it the appearance of being long and straight. At night this is coiled up on one side of the head, and acts as a pillow.

Leaving these people behind, I passed for some days through a district inhabited by bushmen only. They are light in colour, and bigger than their Kalahari fellows. In talking, they give the impression of being in the transition stage, between the click and throat method, of conversing. Imagine the hollow, indistinct utterances such as proceed from a roofless mouth, relieved by numerous clicks, and you know as much of this language as I am able to give you. In 1896 a few of these people, copying the Maiye, adopted the village system and

cereal cultivation for the first time. The great bulk of them still exist on most primitive lines. They wander about the bush without cover, sleeping where they happen to be when the sun goes down, and eating what they find, mainly roots, snakes, and berries, as being easily acquired. In wet weather they place a piece of detached bark over the head, and leave the rest of the body to look after itself.

I entered the Mampukushu country proper, in 18° 12′ 42″ S. lat., and about 21° 25′ E. long. About a century ago these people lived near the Katima Molilo rapids, on the Zambezi, in the heart of the Marotse kingdom, but were removed to the Kwando by Mwanabinye, governor of the Sesheke district, under his brother, the Marotse king,

MUKANDU-BANTU IN LUKAFU MARKET-PLACE, KATANGA.

for quarrelling with a neighbouring vassal tribe. Thence they followed the elephants to the Okavango, and have remained there till to-day. I met one chief, by name Monika, among these people who must have been about 110 years of age. When Sebitwane invaded the country, about seventy-five years ago, he was already a grandfather.

Lebebe is the title of the ruling chief here, and for generations the Lebebes have held an unrivalled reputation as rain doctors. I gave the present man a good wigging for making so much rain when I was on the road to see him, and informed him I considered he had been guilty of a most unfriendly act. He apologized and assured me that had he known of my approach my skin would not have been wet once.

There are some half-dozen rapids in the 70 miles of river passing through Lebebe's country, of which the Popa are the most important. In this stretch the banks are high, and the river no longer winds through the flat inundated plain already described. Passing through the Makwengari country—a people with a bad reputation, who had entrapped and murdered a white man, whom I met on his way thither, three years previously—I reached the confluence of the Kwito, which I traced for over 100 miles. Thence, since the natives informed me that the river made a considerable bend westwards, I travelled north, crossing many tributaries of the Kwando and its affluent the Luiana. There the country, to a very few miles of the Kwito, is drained by the Zambezi system. All this country, to the source of the Kwito in the north, is sparsely peopled by the Mambunda, a large, ill-organized tribe whose lack of unity renders them an easy prey to the more war-like Makwengari from across the river. There is also a tribe of bushmen, with whom these people live on friendly terms—I imagine for the reason that they give timely warning of the approach of Makwengari raiding parties. They are very light in colour, small boned, slightly made, but not unduly short. Their features are strikingly apart from the general rule. In many cases the lips recede like those of a toothless old woman, while the faces even of young men present a dried-up, wrinkled appearance. I struck the Kwito again in 15° 7′ 52″ S. Lat., having travelled from where I last saw it, two degrees south, over high ground, rising to 4000 feet above the sea level, with a minimum temperature for some days of two or three degrees below freezing point. On several occasions my boys found ice on the water in the early morning. I was surprised to find the Kwito so large a river in these latitudes. It is about 80 yards broad, with a deep clear stream winding through a valley a mile wide, bordered by steep undulations 70 or 80 feet high.

From here I travelled in a north-easterly direction to the Kwando-Kubangui confluence, which I reached on June 2. To my personal disappointment I found Captain Quicke had left the day but one before. He, however, had acted wisely, for a chest and throat epidemic raged in the neighbourhood, and he feared an outbreak among his followers. Captain Hamilton had not been heard of, so I waited a week for him in vain. That week proved fatal to my original plans of travelling due north to the Congo-Zambezi watershed, and convinced me of the soundness of a theory which more than one such experience had compelled me to adopt. I had brought my caravan 1100 miles in little more than two months. Both chiefs and porters had behaved admirably, and had been free from sickness. Now, after a week's rest, during which they had become used to thorough laziness, time had been given them to think, and they had persuaded themselves that all they wished for was the indolence of village life. To attain this object my chiefs became almost mutinous, so after warning them of the possible result of their

conduct without effect, I changed my plan, feeling that I could do so without detriment to my work, and marched them straight into Lialui to be disposed of by their king. During these 300 miles they did all they could to get into my good graces, with a view to escaping the wrath to come, but failed. My advice, therefore, to those who wish to accomplish big journeys in Africa without worry or sickness, is, never rest for more than twenty-four hours at one place. Move quickly, but with regularity, and go straight through with your marches, camping, if possible, not later than three o'clock, for natives very much prefer an early camp to a long mid-day halt.

Lewanika was surprised to see me on June 27, and did not disguise his displeasure at the conduct of his chiefs. A week later I witnessed a most interesting trial. My two head chiefs were arraigned before a court comprised of about fifty second class chiefs, peers of the accused, and three first class chiefs—a grade limited in number, and including ministers, generals, and men of influence only. For want of time I pass on to the giving of the verdict. First the junior second class chief (as in our court-martials) gave his opinion and arguments to support it, then the next junior, and so on to the senior of the grade. But not so with the three big men. They were reputed men of strong character, who had the credit of possessing the courage of their own opinions, so (as with our High Court) the senior gave his verdict first, then the second senior, and the junior last. They were unanimously found guilty, and the finding was submitted to the king, who passed sentence, each of the accused being fined an ox. This is one of many customs entitling the Marotse to rank higher than savages. Captain Quicke came in on July 20, after having made a very good journey of some 1500 miles since our parting at Sesheke four months earlier. He had done everything I asked of him, and done it well, but I leave it to him to tell his own story. Here I received news of the fate of the steamer party Mr. Weller, whose health had quite given way, had been compelled to return home. Before leaving, however, he sent supplies to the Kafukwe in a barge, under care of a Portuguese trader, who undertook to forward them to Monzies, a British station in East Matokaland. The trader carried out his engagement, and Mr. Weller's accompanying letter reached me at Lialui.

The sad news of Mr. Muller's death from dysentery was confirmed. His loyalty had killed him, for, fearing that his comrades would be cut off from supplies, he made three attempts to follow with the disease still on him. The third time he got as far as Kashombe on his way to Zumbo, but had to be carried back to Tete in great pain, where he lingered for a few weeks and died. Had he thought more of himself and less of us, I am convinced he would have been alive to-day, and that the future would have seen him in a high rank among African explorers, for he had all the qualities to place him there. Captain

Alexander, with his taxidermist, had returned home. Captain Hamilton, after having been deserted by his porters on the Kwando, had sent one of his chiefs to Lewanika, who immediately dispatched a relief party. He arrived in the best of health and spirits, having added much to our map of Marotseland. Now, as I knew the steamers could not reach us, I abandoned the idea of returning home by the Lakes and Nile, for I could see little advantage in making a protracted journey through districts which had been tramped again and again by many explorers and others. Captain Quicke and I would go out by the west coast, and Captain Hamilton by the east on the completion of our work. Major Coryndon, however, arrived on August 12, and, after many arguments, persuaded me that even though there was little to be done geographically, I might make myself useful in other ways by taking the northerly route. Thus, on September 2, we ate a farewell dinner, hoping to meet in England not many months hence. Captain Quicke and I left the following day, he for the Kafukwe, then north for 250 miles, then west, passing south of the Zambezi, and crossing it at Nana kandundu, and thence to the west coast—a journey of over 2000 miles. I would follow the river to its source, thence along the Congo-Zambezi watershed eastwards, and then strike northwards for the Nile. Captain Hamilton and Major Coryndon were leaving for Chinde and Capetown respectively. It is with real pleasure that I acknowledge Major Coryndon's help and many kindnesses. Had he been a member of the expedition he couldn't have taken a greater interest in its welfare. Of Lewanika's friendly assistance it would be impossible to speak too appreciatively. Ever since he first gave me his assistance in 1895 he has promptly come forward with porters or canoes when asked to supply them, while his marvellous knowledge of the geography of his country has been a great help to me in maturing my plans of action. When I tell you that route-lines representing over 8000 miles have been necessary for the compilation of the map of Marotseland, irrespective of journeys to and fro, you will understand me when I say that without this chief's interest and aid it would have been impossible to have produced it in the time, from the work of two expeditions only.

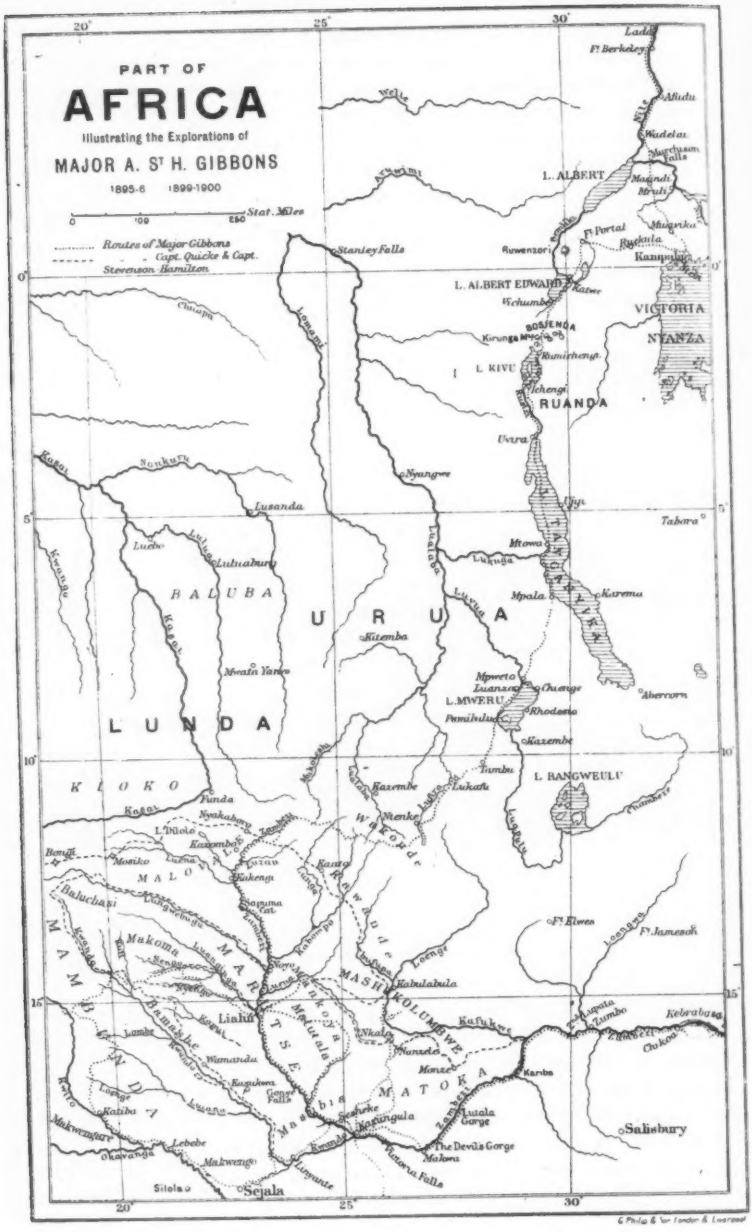
I made the journey up the Zambezi by canoe, taking with me five donkeys—which were driven along the banks—as a reserve means of transport. In 14° 35′ S. lat. the low-lying plain gradually gives place to a bush country, studded here and there with Borassus palms. At a place called Gulwana the bank interested me owing to its uncommon geological construction. Slabs, 5 inches thick, which appeared to be a mixture of calcareous deposit and sandstone, occurred in several layers, with some 3 feet of white sand intervening. In one place these slabs, the sand having been washed clear by the floods, had broken off one above the other, and each one resting on the layer below gave the whole bank the appearance of having been roughly paved.

The Lungwebungu enters the parent river through well-wooded banks in 14° 18′ 42″ S. lat., and is a much larger river than the Kabompo, which flows in 8′ further north. The Zambezi in these latitudes is lined with trees which drop branches vertically downwards, and, like the banyan, they strike root in the mud below.

Except at the very lowest water there is no rapid between the Gonye falls and the Sapuma cataracts in 13° 7′ S. lat. Here the river flows in a torrent through a narrow rocky fissure into a pool of considerable extent. There is much limestone in this neighbourhood. For 10 miles above there are continuous rapids, from above which to a few miles beyond Kakengi (12° 24′ 15″ S. lat.) the banks are high, and on

WEST SHORE OF LAKE MWERU, KILWA ISLAND IN LEFT BACKGROUND.

an average 350 yards apart. Here the river suddenly narrows to 100 yards and under, and is picturesque and tortuous. At Kazombo (11° 52′ 45″ S. lat.) there is a mission-station, presided over by Dr. Fisher, from whom I received the greatest kindness, as I did from Mr. Shindler at Nyakatoro (better known as Nanakandundu—rubber market—a name in use among the west-coast natives only). I made a land journey to this place in the hope of procuring porters, but failed. Many were willing to engage for the journey to Katanga by the trade route, but none could be induced to accompany me to the Zambezi source and thence eastwards; so on October 8 I quitted the canoes in favour of my five donkeys and four boys. The rains had commenced with a vengeance, and travelling through the pathless forest


PART OF
AFRICA
Illustrating the Explorations of
MAJOR A. St H. GIBBONS
1895-6 1899-1900
Stat. Miles
0 100 250
Routes of Major Gibbons
Capt. Quicke & Capt. Stevenson Hamilton
20°
25°
30°
Ladó
Ft Berkeley
Wele
Aliulu
Nile
Madelai
Murchison Falls
L. ALBERT
Semliki
Magandi
Mvuli
Ft Portal
Mujwiku
Ruwenzori
Ruckula
Kampala
Stanley Falls
L. ALBERT EDWARD
Katwe
Wchumbe
VICTORIA NYANZA
Kirunga Mts
BOSENDA
Kamithenga
L. KIVU
Ichengi
RUANDA
Uvira
Nyangwe
Lusanda
Tabora
Mtowa
Lukuga
Mpala
Karema
BALUBA
URUA
Kitemba
Mwata Yanvo
Mweru Luanzara
Chiengo
Abercorn
L. MWERU
Pamilulu
Rhodesia
LUNDA
Kazembe
KLOKO
Tumbo
L. RANGWEULU
Lukafu
Monka
Ft Elwes
Ft Jameson
Kabulabula
MASHUKULUMBWE
Kafukwe
Kebrabasa
Chukod
Liahi
Mwandi
Karriba
MATOKA
Lwalui Gorge
Salisbury
The Devils Gorge
Makona
Victoria Falls
Sesheke
Sesheke
Sesheke
Sejala
Sitola
Lebebe
Makwengo
Okavango
Makwengwa
Katibu
Lwena
Lungo
Kwando
Mamili
Mashi
Mashukulumbwe
Matoka
Tse Tse

was far from pleasant, while the spongy nature of the bogs bordering the tributary rivers made work hard and progress slow, corduroying bogs and bridging streams becoming almost a daily necessity. As for the country, it was pleasant enough, but had been almost depopulated by the slave trade; it was of the usual open forest and undulating type, continually rising until the Zambezi source is reached in 11° 21′ 3″ S. lat. and 24° 22′ E. long. approximately. The neighbourhood of the source, with an altitude of about 5000 feet, is replete with bracken to all appearance similar to our British variety. The river itself has its origin in a deep depression at the base of steep undulations, where the water oozes from a black marshy bog and quickly collects into a well-defined stream. Tall trees, closely interwoven with creepers and undergrowth, spring from this basin and continue for some half-dozen miles along the bed. All the rivers whose sources I visited in this district have a similar origin. I carefully examined every affluent near the source, and experienced no difficulty in following the main stream. Unlike the Congo and Nile, the course of the Zambezi is extremely well defined. Nowhere, from mouth to source, did I find an affluent which can in any sense of the word claim equality with the parent stream. It is interesting to note that the Zambezi, which in Burotse is known as Liambai, and in Lovale as Liambeshe, is called Yambeshe —a sound almost identical with its name on the lower river—in the first 100 miles of its course.

Only 6 miles east is the Lumpemba, running parallel with the Zambezi till the latter suddenly turns westwards. This stream is a tributary of the Lokoleshe, of the Congo system, having its source 3 miles south of the Zambezi. On November 9 I crossed the Kabompo a short distance below its source, which is probably not far from 11° 34′ S. lat., and 25° 17′ E. long. Three nights earlier lions had relieved me of one of my donkeys, and now a second was taken within a few yards of my tent. The marauder paid the death penalty the next day; but I was reduced to three donkeys, and had to lighten off accordingly.

Open grassy downs, at an altitude of 5000 feet, characterize the neighbourhood of the Kabompo headwaters. I found that the river marked Lualaba in the maps, but known by the local natives as Mualaba, rises just north of 12° S. lat., so that long yellow tongue inserted into British red ceases to exist. In fact, the watershed is always north of the twelfth parallel until within a short distance of the Luapula. When nearing the source of the Mumbeshe I overtook the Belgian expedition under Captain Lemaire. I was most hospitably received, and, since we were both bound for Lukafa, the principal Congolese station of Katanga, I gladly accepted Captain Lemaire's invitation to travel with him. We passed five pleasant weeks together, worked absolutely independently of one another, and had the satisfaction of finding that our maps coincided in all essential points.

The soil of this eastern section of the watershed and of Katanga is of red clay. I had left the white sand of the Upper Zambezi basin behind for ever. Iron is the predominating mineral, though a range of hills to the west of the Lufira contains valuable copper ore. In fact, Katanga means copper, and is the *white man's* name for the province. Two days before reaching Lukafu station (10° 31′ S. lat.) I was knocked over with dysentery, and for the next two weeks was the recipient of much kindness and arrowroot from Captain Verdick, the commandant.

Captain Verdick having kindly supplied me with twelve porters, I left his station on January 6 and crossed the equator exactly two months later. My route lay through Mweru, Tanganyika, Kivu, and Albert Edward. It was an interesting journey, but of an easier character than any previous experience. I passed seventeen stations, *i.e.* on an average of one in rather less than four days, and, for the most part, travelled by broad roads connecting station with station. At Mpetu I had the pleasure of meeting Mr. Poulett Weatherly, and at Ishengi on Lake Kivu the German Doctor Kaudt, the work of both which explorers is well known to this Society. Between Kivu and Albert Edward the natives did not appreciate my presence, but they offered no violence, though they purloined my artificial horizon and a rifle. On approaching Albert Edward, I witnessed the misery famine and intertribal warfare can inflict on this unhappy race.

At Toro, in the Uganda Protectorate, where I was most kindly received by Mr. Bagge, the district commissioner, the latest papers reeked with the dismal news of Stormberg, Colenso, and Magersfontein, so I abandoned my intention of travelling down Albert Nyanza, and struck east to Kampala, intending to hurry to South Africa *viâ* Mombasa if more reassuring news were not forthcoming on my arrival. Happily the latest telegrams showed that the tide of fortune had completely changed, so after visiting Sir Harry Johnston at Entebe on Lake Victoria, I turned my face towards the Nile.

I purposely give a very sketchy account of this part of my journey, (1) because you have listened to a detailed account of Mr. Moore's work on the lakes a fortnight ago, and (2) because on leaving the Congo-Zambezi watershed, the principal objects of the expedition had been accomplished. There are, however, two points best mentioned. First, that the volcanic group to the north of Lake Kivu, locally known as Kirunga, are without doubt the Umfumbira (cooking range) mountains shown on the maps many miles to the east; and next that having seen the snowclad Ruenzori range, from an eminence 40 miles east of them, rising peak above peak to such a height as to make the snowline appear to be less than halfway up the mountains, I shall be much surprised if, when the altitude is definitely determined, it is found to fall far short of 20,000 feet.

I reached Lado four days too late to catch Major Peake's sudd-cutting

steamer, which left for Fashoda on May 8. Thus for three months I had to amuse myself as best I could. The country is flat, was inundated and uninteresting, while the mosquitoes were indescribable, and even the great kindness I received from Mr. Engh, the commandant of Lado, and his brother officers, did not compensate me for the trying inactivity of those three months.

Bimbashi Sanders, Governor of Fashoda, took me off in the *Kaibar* on August 7, and a month later I was in England. Not having received letters for fifteen months I was at times anxious about my two colleagues. Now I found they had done splendidly, having not only accomplished the work I had allotted them and reached their respective coasts in safety, but each had found his way to the seat of war, while Captain Alexander has been through the Ashanti war, and Mr. Weller had been to the West Coast and back since we parted. I have only one thing more to say, and I say it in proof of my opinion that there has been a great deal too much killing in Africa. During the last ten years my routes, added to those of my colleagues, exceed 20,000 miles beyond the reach of railroads, and mainly in the most remote parts of Africa of to-day, yet no one of us has found it necessary to take a single human life, and for my own part I would have no compunction in travelling again unarmed over any part of those 20,000 miles.

SUPPLEMENTARY JOURNEYS.

By Captain F. C. QUICKE.

AFTER Major Gibbons and Captain Hamilton had started on their respective journeys from Sesheke in March, 1899, with the kind help of Lewanika, who, owing to the floods, was at Mafula, a station at the edge of the plain, I reached the Nengo confluence of the Zambezi.

Leaving the Nengo, I followed the Luwe through a very pretty valley to its source. The natives here were very busy preparing rubber and making bark-cloth blankets. After passing through the hilly country and crossing the Chikolui and Kuti rivers, I arrived towards the end of May at the Kwando-Kubangwi confluence, where Major Gibbons had proposed we should meet. There was much sickness amongst the inhabitants here.

After a delay of twelve days of general unhappiness, I continued my journey up the Kwando to its source. Leaving the Kwando, I found great difficulty in getting my Marotse to travel any further from home. My path to the Lungwebungu lay over close hilly country some 5000 feet above the sea. There is practically no bird or animal life, the wandering Vachibokwe having long ago killed off anything that

might have existed. They are said to pursue to its extermination even the mouse, so highly do they prize meat. I found the Lungwebungu a great river, and very navigable, winding through an inundated plain 2 to 3 miles wide. The Valuchasi, who inhabited the upper reaches, were very homely. I used to enjoy their singing when gathered together in their villages before dispersing to their work at dawn.

Following the course of the river down to the Zambezi, I had a few days' good sport in the marshes after Lechwe. My headmen and followers behind me were put to flight by a snake—native name "Deruye," a black snake some 6 feet long, of the cobra type, that sat up and disputed our path until I had secured a spear. On another occasion I have been marvellously surprised by its wonderful vitality and strength. I cannot recommend any previous part of my journey to one of sporting proclivities. The country is hardly populated enough for missionary enterprise. The trader in rubber may succeed in future years if the rubber root still exists. Briefly, the main characteristics of the country may be thus described: Undulations, for the most part of white sand covered with forest, trees with very little foliage, no undergrowth, and intersected by rivers of clear water winding through flat alluvial valleys. These undulations rise in altitude and steepness as one travels west, until they may almost be described as hills.

On arrival at Lialui I found Major Gibbons full of fresh plans, forced on him through the conduct of his people.

On September 2 I bade farewell to my colleagues and to Major Coryndon, to whom, apart from his services to the expedition, I am personally grateful for many acts of kindness. First I followed the eastern Luena to its source, from some 20 miles east of its confluence with the Zambezi. I found the river larger than I expected from what I had seen of it near the Zambezi, which it enters in four separate streams. This journey was much pleasanter than my previous one. The Mankoya, untainted by intercourse with the Ovimbundu, are hospitable; like most tribes, they have their special little customs and characteristics. The women of this tribe had a most peculiar cry of greeting—I thought at first it was a cry of terror. The country is picturesque though dried up, bush fires having passed through the woods, charring the trunks and eating up the grass; dark firm soil giving place to the sand I encountered on my journey west. Game is to be found, and lions at one place were preying on the natives, who protect their villages with stockades. Above the Luompa confluence the chief Motondo, with his following and a large band of drums, received me in great state, and sat for hours, for these chiefs never take a hint to go. In his village, the variety of charms amused me, chief preference being given to an old elastic-side boot.

As we passed through the Bamashasha country it became flatter, the trees in the forest standing further apart, but absolutely shadeless. Here

game was very plentiful. Wildebeest and zebra in great quantities would graze in the river valley. After a worrying time with my carriers, I descended towards the Loenge, leaving the constant wind which always blows on the higher land behind me. In about 15° S. lat. I struck the Loenge—a fine picturesque river over a quarter of a mile wide, with slight rapids every 10 miles or so, and numerous islands. I found hartebeest, pallah, waterbuck, pookoo, the lesser reedbuck, bushbuck, and a small gazelle, of which I saw some twenty in one herd, but failed to secure a specimen. I enjoyed my journey up the Loenge immensely, in spite of the constant trouble my porters gave me; for two days they had their loads carried for them, and were driven along by twenty natives lent me by a friendly Mankoya chief. I reduced the chance of night desertion by collecting their bows, arrows, and spears, and later, when I entered Kawandi country, I was somewhat assisted through their fears of the Wakawandi, who often would follow us at a distance. The Lufupa, which I followed to near its source, was smaller, but very similar to the Luena river, *i.e.* a swift stream flowing between narrow banks among the hills, drying up entirely at places at this time of the year on entering the flatter valley. Where I left the Lufupa, I was treated in a friendly way by one Rundumina, who ruled over a cluster of villages, and owed allegiance to Lewanika. The people flocked in all day, and hearing I was fond of eggs, many aged and rotten ones were brought me. The country is high, and teams with white ants, bees, tsetse, horse, and other flies. The noise some nights was not caused by their moving to and fro, but by myriads of white ants simultaneously pecking at the dried leaves, etc., under cover of my round-sheet, making a sound similar to the scratching of a rat. These ants, as is well known, will not feed, except when hidden by something to protect them.

Journeying west, I crossed the Kabompo at its junction with the Mumbeshi. Proceeding up the right bank of the former river, I stopped at a cluster of Mambunda villages, their chief named "Muyanga." I joined him in a pleasant two-day hunting expedition, though one night we were all driven from our fires and brushwood shelters into the rain by the red army ants. These red ants have caused me more uncomfortable nights than anything else. A warm feeling over the arms and head is usually the first awakening; then a simultaneous attack over every part of the body necessitates a hurried flight and removal of every stitch of clothing.

After a twelve-day delay, during which I failed to get either a relay of porters or any information out of the natives, I started off with my Bamashasha in a north-west direction into country inhabited by the Valunda, a wretched, timid race. Then I reached a village, the chief of which, "Kaata," had Mambari visitors trading for rubber. They had come from Nyakatoro, and willingly gave me information, which

did not please my Marotse, who wished to go straight to Nyakatoro. They interrupted me, and were insolent. The Zambezi boy, my personal servant, seized my rifle; on looking round, after depriving him of it, I witnessed the funniest of sights: Kaata and his followers fleeing to their village, his stool upset, his gift of eggs broken, and the manioc flour strewn over the ground; my Bamashasha's backs disappearing in the bush; the Marotse hysterical, and my two Mambari friends calmly seated on their stools. Peace restored, guides were provided for a short way.

Crossing the Lunga one evening, which is a Kabompo affluent, but, nevertheless, a larger river, I noticed for the first time many fireflies, or beetles, giving the same light. I could gather no information, for there were but few inhabitants, and these we could not catch. Owing to the hills, the rains, and lack of food, my carriers became weak and knocked up, and, with the connivance of my Marotse, deserted one night. It was useless trying to go on, so, tired of being a slave-driver, I watched my Marotse pack up their belongings at dawn, and depart; but of course they returned, for they dared not show their faces to Lewanika, and were afraid to travel alone. Finally they took up most of my things, and I made straight for Nyakatoro, arriving soaked through one evening two days after at a Mambari encampment, rubber loads made up, ready to start next day for the west. They fled into the rain, but returned, offered me presents, and we travelled in company. I saw many earthworms for the first time, and in a locality where the white ants were abundant, as proved by the anthills and the constant falling of branches of trees rotten through white ants and sodden with rain. Then I crossed the Luzabo, and later the Zambezi. I was most kindly treated by Messrs. Cunningham and Harford and their kind ladies at Kavungu, a mission station near Nyakatoro, founded by Mr. Arnot, who had travelled this country fifteen years ago. From here I rode a mission ox on to Kazombo, a day's journey down the Zambezi, where Dr. and Mrs. Fisher had recently started a new station. I found Major Gibbons had left about a month before. The first week was a sad one for the little English colony. Dr. Fisher received news of his father's death; Mr. Coppethorne, a fellow-helper, sickened and died, and a lady of the mission was down with fever. The doctor had much to do, yet he took care of every little detail, the same care and attention being paid to the native sick. I would like to talk more of Dr. and Mrs. Fisher and his mission.

Travelling west with a caravan of Valovale—the most unlikable natives I have ever met—I passed through a flat country, jiggers especially favouring this low sandy soil. I met with many more here than when nearing the West Coast, but on entering the Vachibokwe country it became hilly and healthy. At the Portuguese stations of Kalunga, Kameia, and Mosico, the Portuguese officers were most

hospitable. As I passed west, ascending to country 6000 feet high, I stopped at several mission stations, everywhere receiving the greatest kindness. Then I descended into a tropical valley; and after crossing barren hills, Catumbella and the coast was reached. I arrived January 31, eighteen and a half months after leaving the mouth of the Zambezi. I took up my abode in a Dutch house, until a messenger arrived from Benguella, 18 miles off, from Mr. Bullough, offering me a passage on his yacht to the Cape. There are many convalescent and wounded officers and men who have since known that yacht; they would understand my experience on boarding her. I shall never forget the kindness I received. I found my Zambezi boy seated in a deck-chair, his loin-cloth discarded, and clothed in a suit of ducks, a yachting-cap on his head, and smoking a big cigar. Then I became sick, and I think Mr. Bullough and his friend, Mr. Mitchell, are responsible for my wearying you this evening.

Before the reading of the paper, the PRESIDENT said: We welcome here this evening once more our friend Major Gibbons, who read us a very interesting paper only a few years ago. He has now done, if possible, a still more important piece of work in the same region, and he has done it very thoroughly.

After the reading of the paper, the following discussion took place:—

Mr. E. G. RAVENSTEIN: What we have heard to-night from Major Gibbons, and his companion, Captain Quicke, gives us a very imperfect notion of the very important work they have done. That will stand forth very prominently when their map is published; for the map of the Marotse country, tracing their journeyings, is based on numerous observations for latitude, and very careful itinerary surveys, and will prove a valuable acquisition, and one that will stand the test of time. I think Major Gibbons was right to concentrate his energies upon one particular district; it is no use wasting time on flying visits to all sorts of peoples, but as he had no return ticket he did quite right in choosing a different route for leaving the country to that by which he had entered. And the route he chose is one of the most interesting; it took him along Lake Tanganyika, through the African "Interlaken," through Uganda and the Sudan to Egypt. Now about Tanganyika. Up till a few years ago, the lake was delineated in accordance with the map published by the R.G.S. in 1882. Well, at that time, so far as the south of the lake is concerned, we had one trustworthy longitude observed by a Belgian officer, Cambier, who left his theodolite at Karema, where it may be still. On that observation, and a rough triangulation made by Mr. Hore, and the more detailed information collected, and many latitudes, observed by men like Livingstone, Cameron, Joseph Thomson, and above all Stanley, the southern portion of the lake has been delineated, and has stood the test of time. In the delineation of the northern part of the lake we were still dependent upon fragmentary and unsatisfactory information. Mr. Fergusson has recently determined a number of longitudes, and he places the northern extremity 10 or 11 miles further west than the map of 1882. Dr. Baumann, who observed a longitude close by, shifted it 3 miles; but far greater differences exist in the middle of the lake in relation to its eastern and western coasts. Ujiji, according to different observers, varies 31′ in longitude, and Plymouth Rock, the missionary station on the western side of the lake, varies

as much as 45′; and whilst on the old Society's map Usambara lies 11′ to the west of Ntowa, on the new map of Mr. Fergusson these two spots are on the same meridian. I am not prepared to say who is right, but I am happy to say that an International Expedition is now on the spot to do the work which ought to have been done before boundaries were laid down and treaties signed, and it is certain to settle this question. I am confident, having seen Major Gibbons' map, that whatever change takes place in the longitude of Lake Kivu, which was first heard of by Livingstone, miles away, there will be no change in the relative position of these volcanoes from that assigned to them by Major Gibbons. It is satisfactory to find that not only Major Gibbons, but Mr. Fergusson, and I think Mr. Grogan, place Fort George in the position assigned to it by Stanley. I think it must be a great satisfaction to him to find his observation stand the test of time. It is a most important position, for the fort lies very near the boundary separating the so-called Congo State from the British sphere. One other point is that Major Gibbons proved, to my special satisfaction, what I always believed, that Lake Ruisamba extends far to the north, just as Stanley, Lugard, and others found, notwithstanding that one explorer unceremoniously obliterated this extension from a second edition of a map which I had prepared to illustrate his explorations, all the other features of which he retained. I think we are very greatly indebted for the very valuable information we have received.

The PRESIDENT: Prof. Gregory's name was taken in vain a fortnight ago, when he was on his way home; now he is once more with us to-night, and possibly he may wish to say a few words on the subject of the paper.

Prof. J. W. GREGORY: It was only to-night that I heard of the criticisms recently passed on the joint paper by Mr. Scott Elliot and myself. As I do not know what they were, it is impossible to reply. I should like on this occasion to express my high admiration of the magnificent survey of Major Gibbons. One point especially interested me; I was asked some years ago to explain the formation of the Victoria falls, and the only explanation I could arrive at by a study of the maps had one weak point—it wanted more water than at present flows over the falls. If the upper Okavango had at one time entered the Zambezi, it would have remedied that difficulty. Major Gibbons' paper bristled with points of great interest, but at this late hour I can only express the pleasure with which I have listened to it, and congratulate him on his magnificent contribution to our knowledge of one of the most interesting regions in Southern Central Africa.

The PRESIDENT: I can assure the meeting that Mr. Ravenstein and Prof. Gregory have not said a word too much or spoken too highly of Major Gibbons' work. He set before himself a geographical piece of work, which he determined to carry out thoroughly. He has done so during two long expeditions. He has told us that his objects were to ascertain the value of the Zambezi as a fluvial highway. He has done that very completely and very thoroughly. He has told us, also, that he wished to form an accurate knowledge of the resources of the country he went to explore; and his third object, to us the most important, was the geographical survey of that interesting country the Marotse. He has done that by going over routes covering at least 8000 miles, not only with a compass route survey, but also by numerous astronomical observations. I therefore look upon Major Gibbons as the type of a very excellent modern explorer, doing thorough and valuable work over a fixed area of land. To-night we have to thank him also for a most interesting paper, and for the illustrations which accompanied it. In asking you to pass a unanimous vote of thanks to Major Gibbons, I would desire to include his gallant companions, who are present this evening.

FROM ALGERIA TO THE FRENCH CONGO.*

By M. F. FOUREAU.

[After a brief introduction describing the origin and organization of his recent journey across the Sahara, towards the expenses of which the proceeds of the Orgeries legacy were voted by a committee of the Paris Geographical Society, M. Foureau proceeded as follows:—]

All having been satisfactorily arranged, we left Sedrata, the final point of departure, on October 23, 1898. Besides its leader, the mission included four civilians, MM. Dorian, Villatte, Leroy, and Du Passage; while in addition to its commander, Major Lamy, the escort comprised Captain Reibell, and nine other officers, including Drs. Fournial and Haller. The force numbered about 280 men at starting, and the convoy of camels more than 1000.

I will not stop to describe in detail the various branches of scientific work carried out during the course of the expedition. Suffice it to say that I executed a route-survey of the whole line of march, took 512 astronomical observations for the fixing of the more important positions, and made a collection of geological specimens which will throw light on the structure of the regions traversed. The results, together with those relating to meteorology, botany, and ethnography (the two last the more special work of Dr. Fournial, assisted by Dr. Haller), will eventually be published.

Passing over our journey across the great dunes, our stay at Timassanin, and our march across the northern Tassili, I will take up my story at Ain El-Hajaj, the point at which our actual plunge into the unknown began. The route pointed out by the Azjer led by the Wad Samene, but before taking this we examined the country to prove whether no feasible passage existed more to the west. We then attacked the mountain *massif* of Tindesset, the crossing of which occupied four days, rendered memorable by the difficulties of the route. Frowning peaks of sandstone blackened by the weather rose before and around us, and in these grand but gloomy surroundings we seemed like an army of ants attacking one of the pyramids of Egypt. Everywhere were rugged ravines, while a fine cascade—waterless, of course—dropped some 70 feet from its rocky ledge to the lower basin of the Wad Angarab. This rocky chaos ends suddenly to the south in a giddy descent, by which a zigzag, rock-strewn, path leads down to the plain below. We pitched our camp in the Wad Ujidi, at the foot of some high masses of rock covered with ancient Tuareg inscriptions, while close by were some

---

* Abridgment of paper read at the Paris Geographical Society, December 5, 1900, and sent to the R.G.S. by M. Foureau. The illustrations have been kindly lent by MM. Masson, Publishers, Paris.

enormous tombs, which the native legends report to contain treasures. Still passing through a mountainous but easier country, we reached Afara, a spot dominated by the high southern escarpment of the Tassili, where (on January 1, 1899) we experienced a frost which might have made us suppose we were in France. The cliff stretched its fantastic outline along the whole northern horizon, presenting the appearance of cathedrals, obelisks, towers, and all sorts of enormous structures with geometrical outlines.

Here we were joined by our two Tuareg guides, and though the information as to the watering-places on our way was far from clear, we felt that we were really *en route* for Air. We soon began the passage

OUR VANGUARD ON THE TINDESSET.

of a mountainous region called Anahef, composed entirely of quartz and granite, and formed by a series of mountain ranges and rugged plateaux cut by river-beds strewn with rocks. Crossing here the line of partition between the basins of the Mediterranean and Atlantic, we camped at a spot called Tadent, whence, with Lamy, Dorian, and Leroy, I made a five days' excursion to the well of Tajenut, the scene of the massacre of Colonel Flatters and his companions. This excursion proved very trying, both from the rapidity of our march and from the difficulties of the country and the want of water. We passed through the wild and imposing gorges of the Obazzer river, and crossed a region of schists and granite, the sad and desolate aspect of which can scarcely be imagined. The vast masses of Zerzaro, Sodderai, and Serkut rose with seamed and jagged surface above the barren and inhospitable plateau.

From Tadent we soon reached the interminable plain so well likened by Barth to a rock-strewn sea, which the Tuareg call Tiniri. The level expanse of quartz gravel is strewn with blocks of granite, rocky

bosses, and bare and arid lines of hills, the whole devoid of water and vegetation. The camels dropped one after another, adding their bones to the many which mark this terrible track, on which we seemed to be always marching without ever reaching our destination. At last, however, we did reach In-Azaua, where, owing to the mortality among our animals, we were forced to leave a portion of our loads, more especially as we had just received a convoy of dates escorted by Lieut. de Thézillat, who here joined our party. Fifty men of our escort were left with the baggage in a stone fort, to wait until they should be fetched away by Major Lamy. At In-Azaua, which has taken the place of the celebrated well of Assiu, now dry, the last link binding us to France was broken, the last couriers sent after us by Captain Pein reaching us here, and taking back our last despatches for the north. Apart from two official telegrams which reached us at Zinder, I received no news from home until seventeen months later on arrival at Brazzaville.

GORGE OF THE OBAZZER.

A march of eleven days brought us to Iferuane, the first village of Air, situated in the valley of Irhazar, one well only, that of Taghazi, having replenished our water-supply in the interval. The country consists chiefly of quartz, granite, and gneiss, often presenting rounded shapes. It is intersected by broad river-beds, all directed towards the west, and to these the vegetation is confined. Gazelles and antelopes are abundant in them. The inhabitants of Iferuane, which is an unimportant village with a few gardens and palm trees, are Kel-Ui Tuareg, and their slaves. The chief, El Haj Mohammed, who remembers both Barth and de Bary, received us courteously. He showed me a piece of carpet which I had presented some years before to Gidassan, sultan of the Azjer.

East of Iferuane rises a chain of high mountains, named Timge or Tengek, composed of steep, rugged, and bare peaks, furrowed by deep and narrow valleys. In the morning and evening these mountains displayed marvellous colouring, affording us a splendid panorama.

We were now in great straits for want of baggage animals. Major Lamy, who had returned to In-Azaua to fetch on the detachment left there, was obliged to burn a large quantity of barter goods, dates, etc., a necessity which unfortunately recurred, for our stock of camels was melting away like wax. On March 12 an attack was made on our camp by a band of 400 to 500 Tuaregs, who were, however, beaten off with loss, and we gained possession of some animals abandoned by them. Our provisions were likewise exhausted, and it was with difficulty that we could procure millet or sorghum—which, with the flesh of the sick camels and occasionally a little milk or cheese, formed our only food. At this period (March, April, May) dry tornadoes were frequent, and the heat great. To wait would have involved death from starvation, so we decided to make a step forward, taking with us all that our remaining animals could carry, while the rest of our goods were left under the charge of Captain Reibell, with a portion of the escort. On May 26 we reached, after a march of some 30 miles, the village of Agellal, situated at the foot of one of the Air ranges, at a point where the narrow mountain ravines spread out into a wide river-bed covered with fine gum acacias. Here we pitched our tent in an impregnable position on a sort of island formed of granite blocks. The village had been abandoned, its inhabitants having taken part in the attack on our camp. Some camels and other animals, belonging either to them or to other tribes implicated, fell into our hands during reconnaissances made in the neighbourhood. During one of these, a part of our escort was attacked by a body of 700 to 800 Tuareg, who were, however, soon put to flight. On the body of one of the slain we found a Koran containing some fragments of paper, which, from the figures and characters written on them, had undoubtedly belonged to the traveller, Erwin de Bary.

Thanks to the captures thus made, our camp was now a veritable menagerie, but besides meat we had still no food, and it was necessary to move on. On June 11 Major Lamy brought in the detachment from Iferuane, but, our remaining animals being insufficient for the transport of our goods, we were compelled to sacrifice all that was not absolutely indispensable. Clothes, beds, tents, books, photographic apparatus, etc., etc., were all burnt, a portion only of the powder and cartridges being kept. This having been done, we once more set ourselves in motion, and, after a slow and painful march of ten days, reached the village of Auderas. Here, in spite of friendly letters sent by various chiefs of the Kel-Ui, we were still unsuccessful in our attempts to obtain animals. Our immediate needs were met by a supply of food sent for sale by the sultan of Agadez, who would have liked us to continue our route to the south without passing his capital. We thought otherwise, so, after a halt of seventeen days, we decided to march on Agadez, after having, on July 14, in spite of our painful circumstances, organized a *fête* for our

escort. Songs, recitations, and a burlesque acted by native *tirailleurs*, helped to fill up the programme.

We had now with us two Tuareg personages deserving particular mention. The one, Akhedu by name, rendered us great services as interpreter and go-between, both at Auderas and Agadez. The other, named Mili-Menzu, was the chief vizier of the sultan of Agadez, a trustworthy and energetic man, who always showed the greatest devotion to us, and acted as our chief guide from Agadez to Zinder, besides doing other valuable work.

Between Auderas and Agadez the way leads first among the mountains, with a hard and rocky soil, and some rather difficult passes. Afterwards the lines of granitic hills become lower, and are separated by verdant valleys in which the dum palm is the principal tree. The

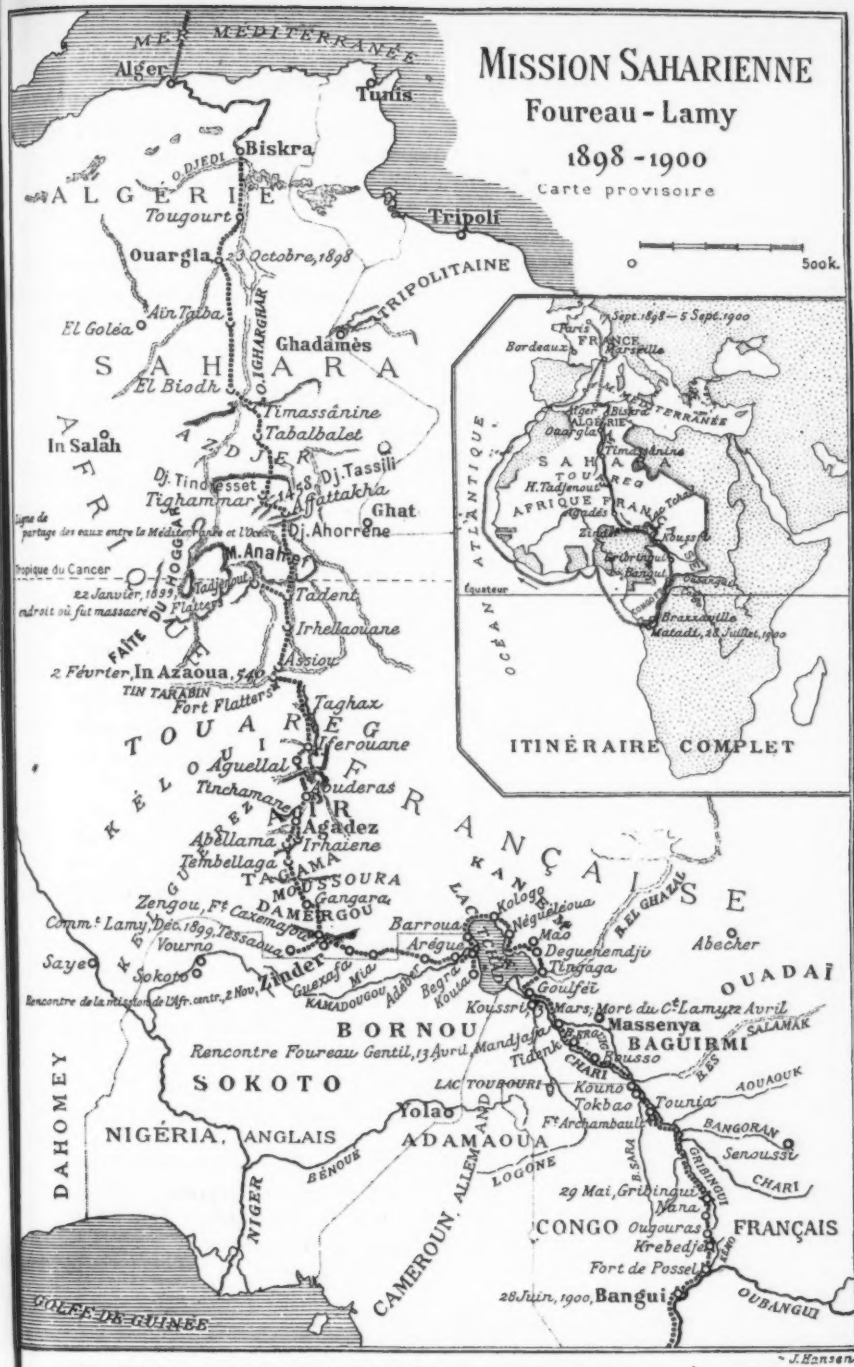
TUAREG GUIDES.

country becomes more and more open, forming a plain, more or less covered with gum-trees, in which Agadez is placed. We arrived there on July 28, and pitched our camp on a small rising ground, in the centre of which is a copious well named Tinshamane. The town has a dreary appearance. Its area is considerable, but more than half is covered by ruined houses. Those which are intact are built of clay, and many have an upper story. A few are quite stylish, all of these belonging to people from Tuat or Tripoli. The abode of the sultan, which has an upper storey pierced by small regular windows, has no architectural merit. It is a massive building, and the projecting beams of the different floors give it an odd bristling appearance. Near it is the mosque, the high minaret of which still remains as in Barth's time.

A market soon sprang up just outside our camp, at which were sold, in addition to a few oxen now and then, a large number of sheep and

goats, guinea-fowl, poultry, pigeons, ground-nuts, millet flour, dry cheeses, beans, a little sour milk, and some excellent tobacco brought from Kano and Katsena. In spite of the sultan's protestations of friendship, our daily supply of millet was obtained with the greatest difficulty, and threats had constantly to be employed. We obtained from the sultan a few camels and donkeys, but, finding that his power was extremely limited, and shared with other important chiefs, we decided to set out with the supplies we had for Zinder, whither we directed our course on October 10. The sultan supplied us with a guide, who, we were told, would conduct us each day to a water-supply. We were soon undeceived, however, for at the first halt we found only enough water to give a glassful to each man, and none at all to the animals, while the next day pools of rain-water were only found after a long search, near the hills of Irhaien. Our guide seemed to be purposely leading us gradually round to the north, and there was nothing for it but to make our way back to Agadez, where we arrived after an absence of ten days, during which the position had been more dangerous than ever before. This march, made under a high temperature by men heavily loaded, without a drop to drink, and mostly walking barefoot, has hardly a parallel in the history of exploration.

We were now in a sorry plight, and the ragged condition of our *tirailleurs* almost beggars description. Our second stay at Agadez brought no change in the attitude of the local authorities. Vigorous measures were necessary, and our end was only attained after the seizure, by our escort, of the two wells which supply the town, upon which we obtained a hundred camels and a few donkeys. We finally left Agadez, under the guidance of Mili Menzu and one or two others, on October 17, 1899, making our way by long and rapid marches across the districts of Azauakh and Tagama. Azauakh is a desert zone, bare and arid, marked by small outcrops of reddish sandstone. Tagama, which in the Tuareg language means forest, is everywhere covered with bush of greater or less density, broken here and there by treeless patches. These, as well as the ground beneath the trees, are carpeted with *gramineæ*, the most abundant species, named karenjia, being greedily eaten by the animals, though quite a plague to travellers by reason of the invisible spines with which the covering of the seed bristles. The *karenjia*, to which Barth devotes several pages of his work, is met with as far as the lower Shari. The scrub consists chiefly of dwarf gum-bushes, with here and there larger trees, especially a leafy species of *Ficus*, closely resembling the chestnut in appearance. The abundance of game in Tagama is incredible. It includes three or four varieties of antelope, wild boar, lions, giraffes, partridges, guinea-fowl, etc., many of them very tame. Damergu is much more open than Tagama, displaying small patches of wood and immense fields of millet, which had been reaped at the time. At Gangara, a large village in Damergu, we joined



J. Hansen

SKETCH-MAP OF ROUTE OF FOUREAU-LAMY MISSION. REPRODUCED FROM *LA GÉOGRAPHIE*.
SCALE 1 : 20,000,000, ABOUT 312 MILES = 1 INCH.

our vanguard, which had preceded us by two days under Major Lamy, and then, after passing through several other villages, arrived at Zinder. By this time our numbers had been swelled by the addition to our company of many negro women, mostly slaves who had fled from their masters in the hope of regaining their homes, and of whom many found fathers, mothers, and brothers in various villages of the Sudan. Most had attached themselves temporarily to many of our *tirailleurs*, whose board and duties they shared.

At Zinder we found a detachment of 100 Senegalese under the command of Sergeant Bouthel, who formed the garrison of the place. They were the only remains of the Voulet mission, Lieut. Pallier having started for the Senegal, while Lieuts. Joalland and Meynier had proceeded to Lake Chad a month before our arrival. As our escort, ragged but full of ardour, filed before them, to the salute of the two flags and the bray of trumpets, it was a moving and inspiriting spectacle.

Zinder is a large and fine town, surrounded with high earthen walls very thick at the base and pierced with seven gates. The town covers a large area, and its houses are in part built of clay after the style of those of Jenne so well described by M. Dubois, in part of straw, and furnished with small courtyards enclosed with high mat walls. The palace of the *serki*, or sultan, occupies a large space, but is also built of clay, and has no artistic merit. The pleasing aspect of the town arises firstly from the variety of form of the houses and the irregularity of the ground, and secondly from the presence of trees and bushes, including the *alinka*, baobab and borassus palm, scattered at random over its area. A whole section is occupied by a pile of rocks and blocks of granite rising higher than the walls and commanding a fine view over the place. Outside, not far from the wall, is the French post, Fort Cazemajou, on a mound of huge granite blocks. It was presented to France by a Tuareg merchant, Mallem Yaro, a remarkable man who proved exceedingly well disposed, and rendered us valuable services. His present residence is at Zengu, the Tuareg suburb of Zinder. It serves also as a warehouse, and in it I saw, in the midst of cottons, silks, ostrich feathers, spices, etc., a variety of unexpected articles, such as French scent-bottles, Arab bon-bon boxes from Tunis, bottles of Hunyadi Janos water, and cages of live civets, from which the musk is extracted weekly.

It was through Mallem Yaro that I despatched a courier with letters for France on November 3, 1899. These despatches I supposed to be lost until, on October 23 last, they were placed in the hands of the French Consul-General at Tripoli, who obligingly forwarded them to me. They had thus taken a year to reach their address, but the fact that they did arrive shows the trustworthiness of Mallem Yaro's agents.

In front of one of the gates of Zinder there is a market formed of

rows of sheds divided into little shops. A little of everything, from cottons to tobacco, jewels, salt, kola-nuts, etc., is sold here, by negresses seated in parallel lines. The wares even include appetizing dishes of meat broiled on the spot. The scene at this market is an animated one, especially about four o'clock, when the going and coming is incessant. The scavenging of the town and market is the work of the numerous vultures, of a species distributed, like the various kinds of turtle-doves, throughout the whole country from Air to the Congo.

During our stay at Zinder, Major Lamy with half the escort carried out an expedition towards Tessaua, for the purpose of enforcing the obedience of certain recalcitrant chiefs. He collected, either as tribute or as fines, nearly 300 horses, and as we were also furnished with 100 camels, by a section of the Kel-Ui, we were in a position to continue our journey. I was pleased to find at Zinder a telegram from the Minister of Public Instruction, authorizing me to choose my own route for the return journey; and I did not hesitate a moment to order an advance eastward, as the original programme had in view, besides the crossing of the Sahara to the Sudan, the journey from the latter to Lake Chad and Kanem, and eventually the junction with M. Gentil on the Shari. On December 27 we performed the last obsequies for the remains of Colonel Klobb, which had been brought in by Major Lamy after his journey to Tessaua, as well as for those of Captain Cazemajou and his interpreter Olive, which had been previously rescued from a dry well into which they had been thrown.

On the 26th Major Lamy had set out with the first detachment, and on the 29th I followed with the remainder of our escort under Captain Reibell. We joined hands with the advance guard on January 9, 1900, at the villages of Adeber, and did the rest of the march together. The country, here named Manga, contains some fine villages. Thin bush alternates with clumps of trees and wide grassy plains, with numbers of swamps impregnated with carbonate of soda. These depressions are always surrounded with Dum palms. Much salt is extracted from the mud and water of these lakes, and is used throughout a large area. The producers do not cultivate the ground, but exchange the salt for millet. From Adeber we marched through grassy plains, dotted here and there with tamarinds, to the Komadugu Yobe, which contained a narrow stream of water, and of which the banks are everywhere covered with a thick belt of forest. At the village of Begra, on its banks, we found the sheikh Ahmar Sinda, son of the sultan of Bornu, dethroned by Rabah. We were present at his investiture as the new sultan of Bornu, in which a number of chiefs from all sides took part. He had just arrived from Zinder, and seemed to rely on our aid alone for the recovery of his throne. He never left our side, and was still with the escort when I finally left for France.

During all this time our supplies of food were extremely limited,

millet being very scarce in the salt-producing country. We often went hungry, and I well remember my delight at discovering one day, in a box of other articles, some small tablets of chocolate, which seemed to us, long deprived as we had been of sugar in our diet, as food fit for a king. Our wretched animals were still strewing their bones along the road, their only food being dry grass, which supplied very scanty nutriment; and in regard to food-supply, our situation became daily worse until we reached Kusri. All the villages along the Komadugu had been pillaged and burnt by the bands of Rabah, and heaps of human bones lay whitening on all sides. Even Kuka, the former flourishing capital of Bornu, with its hundred thousand inhabitants, had come off no better, being now nothing but a melancholy heap of ruins. Crumbling walls already covered with creepers, trees growing up in the interior of the houses, thousands of earthern jars, broken or whole, are all that meets the eye in the once proud queen of the Sudan.

It was on January 21, near the village of Arege, that I had my first view of Lake Chad. At this point the lake was fringed with reeds, but openings permitted a clear view of the open water gleaming in the sunlight, and enlivened with large numbers of birds. Above high-water mark the ground was cultivated with cotton, a little of which is generally seen in similar situations. Further south the road skirts the edge of the open water with no reed-barrier, and we observed a considerable swell, which indicated a certain depth. The water is fresh and good to drink. The area between Kuka and the lake, and the whole northern part of this region, abound in large game, including elephants, which showed themselves very tame. Our route now led in a circuit round the shores of the lake, and we passed by Barrua, Wadi, and Negigmi. The huts of this last village were intact, but had been abandoned by reason of the frequent raids of the Ulad Siman and Tebus. Further on we touched at the watering-place of Yarra, and beyond this at the village of Kologo.

Above high-water mark, round the whole north-west and north of Lake Chad, there is a continuous chain of gently sloping sand-hills covered with bush, and forming the virtual shores of the lake. The ground is everywhere strewn with the remains of huge fish, and the whitened bones of hippopotamus, crocodiles, and elephants. Game simply swarms, and on one occasion the troops of antelopes occupied more than ten minutes in galloping past our encampment. Giraffes, lions, and rhinoceros are also abundant. On the west side we had seen some canoes of the Chad islanders, the Buduma. These canoes are made of bundles of reeds tied closely together, and, though heavy, are unsinkable, albeit the crew are practically seated in the water. The form is that of an ordinary undecked boat, with an elevated prow. The Buduma are thorough-going banditti, making slaves of all the stragglers they can lay hands on to sell on the opposite shore.

Beyond Kologo our route took a decided bend to the south-east. We now left the shores of the lake proper, which here split up into a number of lagoons, running with winding contours far into the land, and compelling us to make wide *détours*. Not until the villages of Negelewa did we catch sight, and that for the last time, of the shining expanse of Chad, here studded with islands. Beyond this we entered Kanem, the principal oases of which lay to the east of us. At Degenemji, near Neguri and Mao, we fell in with Lieut. Joalland, who had come to meet us with thirty horsemen from his camp at Gulfei, on the Shari, to which a rapid march of five days now brought us. Our junction with the old Voulet mission was thus effected.

During these five days we had first to cross level plains, now covered

WATERING-PLACE AT YARRA, ON LAKE CHAD.

with tall dry reeds, but inundated in the wet season, and then to follow the margins of a series of lagoons, obscurely connected with the lake. Further on the plain became undulating, and was varied with patches of wood, with occasional large sycamore figs and numbers of the *teboraq*, a tree which we had constantly seen since reaching the northern Sahara, and which continued with us as far as about 7° N. The natives use its bark for soap, and eat the slightly bitter kernel of its fruit. In this march we had crossed the region named Bahr-el-Ghazal on our maps, which must not, however, be taken for a river, nor is it by any means an effluent of the lake, as some have imagined, but merely a sort of lagoon or narrow gulf, along which, according to native statements, the water, at times when the lake is unusually full, extends some 40 miles into the land. Beyond, the bush thickens, with clumps of large trees (tamarinds, etc.), while anthills are seen on all hands. The country is cut up by numbers of dry channels, with black soil fissured by deep and

wide cracks. It is plain that the whole is covered in the rainy season by an overflow from the Shari and the very numerous branches of its delta. The thickets are the haunt of game of all kinds, from guinea-fowl to rhinoceros, the latter being very abundant.

At Gulfei the Shari is a fine river, and although it was the season of low water, its bed had an imposing width. We stayed but a short time, but soon afterwards halted three days at Mara, where we crossed the river, the men passing over in canoes. The transport of our animals occupied nearly two days, and resulted in the loss of a certain number. On the other side we continued our way to Kusri, an important town at the junction of the Logone with the Shari. The place was strongly held by a detachment of Rabah's army when, on March 2, the expedition encamped within a few miles of it. After a night's march through the bush, Major Lamy made a brilliant assault, and took possession of the place at 3 a.m., the enemy losing heavily both in men, arms, and supplies.

Rabah and his forces were in occupation of Gulfei, Karnak-Logone, and Dikoa, but we received the most contradictory reports of his movements. His army was well organized, the marching regiments being supplied with information by mounted scouts. In battle, the guns and cartridges of the killed and wounded are collected by negro archers and lancers. The empty cartridge-cases are refilled by his armourers, and are very deadly when used. As soon as we were installed at Kusri, troops of natives began to arrive in large numbers, camping round the town, with the object of gaining our protection against Rabah. The number of these people who stationed themselves round Kusri in the space of a month may be estimated at at least 10,000 to 12,000, their flocks reaching a total of 157,000 head of oxen, sheep, and goats. They all belonged to the various sections of the Shuas—a light-skinned race of oriental origin, widely distributed throughout Bornu and on the eastern bank of the Shari. Their proper language is Arabic, which all speak more or less, though commonly using the speech of Bornu and Bagirmi. The women are well made, with delicate features, and show no appreciable trace of negro blood. Their hair is long, and divided into a number of fine tresses, while a larger one behind is sometimes formed into a coil. They all wear round the hips a number of strings of large white and blue beads. The towns of the lower Shari—Shaui, Gulfei, Mara, Kusri, Karnak-Logone, and some others—are inhabited by a race of fishers named Kottoko. These people are of a deep black, with woolly hair, but, though ugly (especially the women), are well-made. They fish both with nets and with the harpoon, and their canoes are made, for this purpose, extremely stable, about 40 feet long, and 5 or 6 feet broad at the stern, the bows running out to a high point. A huge net, supported by two enormous antennæ-like spars, is fixed at the stern and worked by a great lever. It is let down until it almost

FISHING-BOAT ON THE LOWER SHARI.

touches the bottom of the river, when the canoe is moved slowly along, the water being at the same time beaten by two boys in a smaller canoe. The net is then raised, and the fish fall into the large canoe. The rivers abound in fish, and the takes are usually good.

Kusri lies some 30 feet above the Logone, the houses reaching close to the bank. They are solidly made of clay, generally rectangular, but occasionally cylindrical, with thatched roofs supported by a framework of stout poles. Some of the rectangular form have upper stories, but all have very small entrances. Many possess beehives, arranged much after the fashion of those kept by the Kabyles of the Aures, and hives are also placed in trees, both in the towns and in the bush, where wild bees are very abundant.

We had not yet received replies to the despatches sent to M. Gentil, but had heard from Captain de Lamothe, who commanded his advance party, and who was now at Masere, a town of Bagirmi, not far from the old capital, Massenya. We thus learnt that the whole Gentil expedition was descending the Shari to join us. Meanwhile sixty camels and a score of canoes were sent by Major Lamy to M. Gentil to facilitate his advance. The Sahara expedition had finished its task, and its escort was henceforth at the disposal of the Government Commissioner for any military operations that might be deemed necessary. I therefore set out on April 2, with the canoes and thirty men, and on the 11th met M. Gentil at Manjafa. This meeting stirred us deeply, and nothing was wanting to the impressiveness of the occasion. Advancing through a country made known by his own efforts, Gentil was brought face to face with a compatriot who had set out from the opposite extremity of French Africa, and the last link of the chain connecting the Mediterranean with the Atlantic was now complete.

With an escort, canoes, and a guide kindly provided by M. Gentil, I resumed my ascent of the river on April 14, the Gentil expedition continuing its route to Kusri. For three months and a half I was entirely without news from my rear, and it was only at Brazzaville, on July 21, that I learnt the sad news of the death of Major Lamy. Not till much later, after my arrival in France, did I hear of the brilliant operations, conducted by Captain Reibell, which had led to the complete rout of the army of Rabah.

On my voyage up the Shari and Gribingi, which lasted fifty-six days, I had with me Vilatte and the four Shambas from Wargla, who had served us so faithfully ever since we left Algeria. The voyage was a monotonous one. The water was low, and we were at times reduced to the necessity of dragging our canoes over the shallows. Our slow rate of progress allowed the Shambas to land frequently for a hunt, and game was so abundant that our larder was kept constantly replenished. The rainy season was now beginning, and we were visited by frequent tornadoes, which raised big waves, and forced us to take refuge beside the bank. At these times the crew would jump overboard, remaining up to their necks in the water, and covering their heads with an inverted calabash until the storm abated; the reason for this behaviour being that the temperature of the water would be about 86° Fahr., while that of the rain would be scarcely higher than 75°.

Besides innumerable hippopotami, crocodiles, and antelopes, lions and rhinoceros occur in large numbers. Certain districts along the Shari swarm with elephants, and one night, when encamped on a sand-bank, we were surrounded for two hours by a whole troop of these animals, who paid little heed to our feeble camp-fires. Only a short time ago the banks of the river were lined with fine villages, but all

PASSING THE GRIBINGI RAPIDS.

had been destroyed by Rabah's forces. The inhabitants had in part dispersed over the bush, but some had built straw huts either on the shore or on sandbanks, whence they prosecute their avocation as fishers during the period of low water. Even at this season the Shari is a fine, wide river, whilst at high water it becomes a majestic stream, with a width, in places, of 4 to 5 miles. It spreads, besides, over the plains on either side, forming innumerable lakes and backwaters. The ultimate banks are marked by tall bush, which acquires a more tropical character the further south one ascends. Only one station—that of Tunia, or Fort Archambault—has been established on the stream.

On leaving the Shari proper and entering the Gribingi, the scene

SUSPENSION BRIDGE OVER THE GRIBINGI.

changes. The latter river hardly exceeds a width of 60 yards at the confluence, while at the Gribingi station it is little more than 20 yards wide. It is broken into various sections by rapids, which at the time of our passage carried very little water, and often involved difficult portages. At high water these spots are marked by violent eddies, due to the force with which the water dashes against the submerged rocks. The bush, which alternates with open spaces, is enlivened by a variety of birds and monkeys, while the river view is varied by precipitous rocks and sharp bends. The current is frequently obstructed by fishing-weirs, which the natives construct by throwing large trees across the stream, and fixing wicker traps in openings among the submerged branches. It was with difficulty that I could restrain my men from visiting these traps and appropriating their contents. On the upper course of the river we came upon several picturesque bridges, formed of lianas stretched between trees on either bank.

At the Gribingi station we left the canoes, and proceeded by land

for a distance of nearly 200 miles, I riding on an ox, while our baggage was carried by porters. The rains were now in full swing, the grass was green and very high, and we lived in a perpetual state of moisture. At Fort Possel, on the Ubangi, we again took to canoes, while the latter part of our voyage to Brazzaville was made by steamer. From Bangi onwards I had the benefit of the company of M. Bonnel de Mézières and M. Mercuri, the former from the sultanates of the Bahr-el-Ghazal, the latter from the upper Ubangi and the country of Senussi.

We everywhere met with the most cordial reception, and from Brazzaville had an easy journey by rail to Matadi, where I took ship for France, happy in the thought that my work was now accomplished.

EXPLORATION OF ANTARCTIC LANDS.*

By HENRYK ARCTOWSKI.

On Friday, January 14, 1898, the *Belgica* left St. John harbour in the morning, and obtained a sounding near the shore giving a depth of 162 fathoms; a second sounding later in the day gave a depth of 855 fathoms. Next day we lost sight of Staten island, and obtained a sounding of 2209 fathoms. This was our first discovery—an unknown depression lying close to the extremity of the Andes, the steep slope of the mountains being evidently continued under the sea. The prolongation of the great mountain chain is to be looked for to the east of Staten island, which forms the last fragment of the Andes; but in that case, what can we make of the Diego Ramirez islands south-west of Cape Horn? The latitude at which we had found the deep sounding was within a few minutes of that of the Cape, the exact position being 55° 51′ S. and 63° 19′ W. One is led to speculate as to whether the chain of the Andes does not open out like a fan, as so many other mountain chains do.†

On January 19, Commandant de Gerlache pointed out the ice-blink in the south. The sky was uniformly covered with a thin layer of stratus, and just at the horizon a white line appeared like a longitudinal slit, detaching itself by its brightness from the grey of the sky. It was discontinuous, a little undulated, not rising more than from 10′ to 25 above the horizon. At 8 p.m. Lecointe reported the first iceberg, which appeared like a dome rising sharply out of the sea at a distance of about 10 miles. The soundings had given depths of 2105, 2078, and

* Personal narrative of the twenty landings on the lands discovered by the Belgian Antarctic Expedition.

† Arctowski, "The Bathymetrical Conditions of the Antarctic Regions" (*Geogr. Jour.*, July, 1899); and Arctowski, "Observations sur l'intérêt que présente l'exploration géologique des terres australes" (*Bull. Soc. Géol. de France*, 1895, p. 589).

that morning 2018 fathoms; the depth was thus diminishing towards the south.

On the 20th we sounded in 62° 2′ S. with a depth of 1586 fathoms, and at 4 p.m. land was sighted on the horizon, and the depth in 62° 11′ S. was found to be 1028 fathoms. Thus the bed of the ocean was rising fairly steeply when near shore. At 6 p.m. we were able to make out high mountains, the summits standing out black against the sky, and the

FIG. 1.—PART OF THE TRACK OF THE *BELGICA*.

gentler slopes covered with snow; these were the South Shetlands, discovered by Dirk Gerritsz in 1599, and re-discovered by William Smith in 1819. At 9 p.m. the profile of the land was so clearly visible that by means of a field-glass I was able to make a sketch of Livingstone island. Smith island, which was visible to the right of Livingstone island, plunged almost perpendicularly to the sea; it appeared to be a rounded mass cut here and there into cliffs. We had to pass between these two islands. A large iceberg appeared in the south-south-east, and others

lay off the islands; at eleven o'clock we passed some pieces of floating ice, and saw more towards the south, and then a little fog, accompanied by fine rain, shut out the view.

On Friday, January 21, while we were at breakfast, a little after eight o'clock, we felt a sudden shock, which seemed to lift the ship twice; rushing on deck, we found that a thick fog made it impossible to see any distance, but on the starboard side there was a large mass of ice, here and there vague forms of icebergs loomed up ahead, and quite close to us we saw the rock on which the ship was fast. The fog lifting a little, let us see that we were surrounded by rocks. Some of the large blocks of ice were aground, others afloat. On deck no one spoke; nothing was to be heard, although the weather was calm, but the roar of the breakers on the rocks and the cracking of the ice. The engine went astern, and after a few moments we were afloat again. Splinters of wood torn from the keel rose to the surface, and helped us to realize the gravity of the danger we had escaped.

The splendid spectacle of the icebergs, however, made us forget all else. One of these was like a tower cut out of a great block of sugar; another, a mountainous island, with a bay in which the billows broke in foam; yet these were mere fragments of icebergs, broken and of fantastic outline.

At eleven o'clock more ice appeared, and also more rocks, which gave an anxious time to Lecointe, who was on watch. The fog lifted about noon, and for a few minutes we could see a low land covered with great fields of snow, which terminated in the sea as perpendicular cliffs of ice; this was probably Snow island. Other land could be seen further to the east, with summits bare of snow. Several large bare rocks rose abruptly in front.

On Saturday, January 22, the number of the ship's company was unhappily reduced to eighteen, poor Wiencke being carried overboard by a wave and drowned. It was terrible to be quite near a man who was fighting with death, and yet to be unable to help him. All our efforts were in vain; twice he was almost saved, but Fate willed otherwise.

Bad weather commenced at night; all day the wind had been blowing in heavy squalls, and the sea was rough. The fog continued, and in the afternoon snow began to fall. Since morning icebergs had always been in sight, looming up vaguely through the fog, or appearing in all their splendour during the short clear intervals. Many of them were tabular; complicated forms were less common, for they had come from no great distance, doubtless originating in the land which was in sight. The ship had at length to be laid-to, and, the gale increasing still further, it was necessary to seek the shelter of an island, which no doubt was Low island. At 6 p.m. the weather cleared, and allowed us to see the island, which is extensive and surrounded by large bare rocks, but

itself completely covered with a thick mantle of ice and snow, which hides all irregularities under a uniform surface, and descends to the sea in perpendicular cliffs of ice. Bird-life was very abundant in the "rookeries" which we saw round the island, full of penguins, and lending a strong odour of guano to the breeze. We resumed our way, and the island dropped out of sight.

On Sunday, January 23, the sky cleared at last, the clouds parted, the sun shone, and our radius of vision gradually extended. We were to the west of Low island, which we could now see much more clearly. It seemed to be low and entirely surrounded by huge rocks and abrupt islands quite free from snow. The air was poisoned by the smell of guano. M. de Gerlache changed the course to east-south-east, in order to enter Hughes gulf, and we passed again some icebergs seen on the previous night. One of these was particularly fine and characteristic, with a height of 130 feet and a length of 250 yards. I made two drawings of this berg from different sides. These represent it as a plateau bordered by cliffs and topped by a mound. On one side one could see that the summit was composed of thin layers of snow, perfectly parallel and horizontal. The colour of the ice at the base was a very pale greenish blue, but the blue was intense in a large hollow—a veritable azure grotto. Position at noon, 63° 28' 30" S., long. 62° 13' W.

On leaving the island the floating ice was gradually left behind, the weather again became squally with fog and rain, and about 3 p.m. more ice appeared again; generally in a tabular form, but sometimes as isolated peaks or as tables dipping to one side, in which case the lines of stratification remained parallel to the surface of the berg. The weather gradually cleared, and land was sighted, at first a series of islands and rocks, and then a more extensive coast. At 7 p.m. we passed close to a headland, which very probably was Cape Cockburn, but as we went on the charts became valueless; what we saw corresponded to nothing that they represented, and Lecointe proceeded to take bearings at frequent intervals, which allowed him to construct an approximate chart. At 10 p.m. land seemed to block further advance towards the south; high mountains appeared on the horizon, and islets and rocks were scattered over the great bay at whose entrance we had arrived. Many places were clear of snow, and numerous peaks projected above the ice-sheet, so that it would be possible to study the geology. At 10.30 we were close to an island, and de Gerlache, Racovitza, Cook, and I got into a boat and made our first landing in the antarctic regions (see Fig. 2, I.). A considerable part of the island was uncovered. The upper part was like a lava-flow of prismatic structure; lower down the rock was completely cracked, and seems to decompose in large superimposed blocks with straight surfaces. It is an eruptive rock of great density, very hard and brittle, and rings on a blow with the hammer. It is not basalt, but of granitic structure and very fine-grained; its colour is a very deep green,

and I thought that I saw small crystals of hornblende—if so, the rock is a diorite. I had no time to examine the snow, as it grew dark, and we had to return on board.

Monday, January 24, was a day of discoveries, and it is impossible to put down here all that I saw, or even everything which struck me as of special interest. During the night the *Belgica* had to be

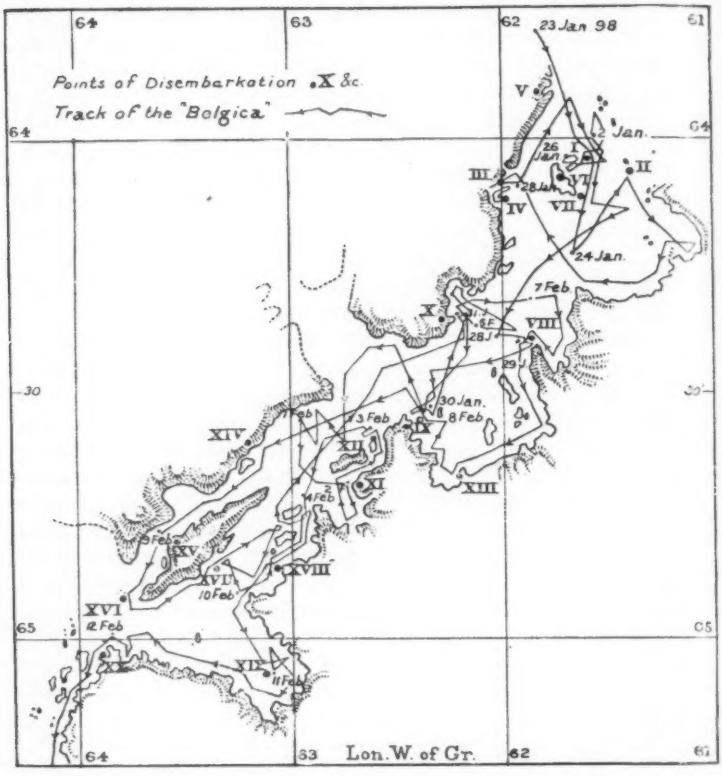


FIG. 2.—PART OF THE TRACK OF THE *BELGICA*, SHOWING LANDINGS.

manœuvred to avoid icebergs, and to prevent being driven on shore by the wind. In the morning it was necessary also to go out of our way a little in order to recognize our bearings of the night before, and to find the islet on which we had made our first landing. In passing close to an island which was almost free from snow, Racovitza, Danco, Amundsen, and I got a boat out and landed for the second time (II. on map, Fig. 2). It was a small narrow island, no more than 100 feet

high, and appeared to be surrounded by a close colonnade on account of the regular vertical cracks in the rock, which were doubtless produced by extreme cold. The surface was frequently mammilated and worn smooth by the ice. A little sandy clay mixed with guano was found in small pockets between the rocks, and while examining this clay I had the pleasure of discovering the first antarctic insect, almost microscopic in its dimensions.

In the afternoon a breeze sprang up suddenly, and the sky gradually cleared; but the fog descended on us again with equal suddenness, just as it does on mountains above the cloud-level. Every now and again a momentary clearing revealed a beautiful picture of mountain peaks, the bases of which were covered, of great glaciers losing themselves in the clouds, or of fantastic icebergs, everything appearing larger than nature because there was no perspective, and the fine pictures themselves were vaguely framed in cloud. The light, however, was abundant, the low clouds which sometimes touched the sea were white and even brilliant, and sometimes a beam of sunlight threw a sparkling lustre on the ice, or on the great snow-fields, or on the sea.

The silence which brooded over this unknown world was singularly impressive, but occasionally a mountain of ice would collapse with a thundering crash. One could hardly believe one's eyes when these changes in the fairy-like scene occurred, were it not for the dull rumbling growl of the disrupted glaciers. In fact, this realm of eternal ice is so different from anything one had seen that it appeared another world altogether; in sober truth, I do not believe that in any fable the human imagination has described what we have seen there.

From the point of view of astronomical observations Lecointe has been unfortunate, as the sun had rarely shown itself, and he had only been able to fix the latitude (64° 9′ at noon). He kept up a continuous survey of the coast as we passed near the shore, and so succeeded in making a chart of Hughes gulf. The only maps which we possessed—and they are all that exist—were the British Admiralty chart, No. 1238, and Friederichsen's map. The general result of the day's work had been the discovery of an elevated land where Friederichsen's map bore the inscription, "No land in sight (Larsen)." Towards the east and south an uninterrupted coast-line stretched as far as the eye could reach, but in the south-west a large strait opened into the gulf, and this it was necessary to explore. The land in the north-west was also divided by a channel, towards which the commandant first directed the ship. The large bay which we had coasted during the afternoon was very free from ice, although as we went further into the bay the number of bergs increased, but still the *Belgica* had no difficulty in approaching close to the shore. At the head of the bay my attention was particularly drawn to the floating ice. Several of the numerous icebergs were of quite respectable dimensions; their form varied considerably, but usually

more or less tabular; one of the bergs was pierced, forming a floating triumphant arch. The stratification of the ice was rarely noticed, but in diffused light it is not easy to make out the difference between the alternate layers of blue and white ice; still, in the upper part of the walls the stratification of the *névé* was often seen. The blue colour of the hollows in the ice was more intense as the light was stronger. Each berg was surrounded by a wide horizontal groove formed by the waves at the level of the sea, and one could often see the grooves of former levels, which showed that the position of equilibrium had changed, and one little iceberg to which we were very close showed two such lines which crossed each other. The surface of the ice reflected so much light that Cook was able to take instantaneous photographs of the floating ice down to the moment of sunset, and even a little later; they were rather faint, it is true, but the outlines were quite clear. It was very difficult to judge distances, one piece of snow-covered land lying in front of another appearing to be part of it, and thus it was necessary to follow the coast very closely in order to distinguish islands from peninsulas.

The quantity of snow which has been accumulated in this region is really formidable. The westerly and northerly winds coming from the ocean doubtless bring great falls of snow, and this is always accumulating, mountains of ice being reared on the top of the mountains of rock. So far as I could judge from the ship, the ice was nowhere uncovered, but thick snow seemed to lie on the glaciers down to the very edge of the sea.

The sunset was very fine, and after it, about 9.30 p.m., the clouds were brilliantly coloured, and the south-western horizon became remarkably clear. At ten o'clock the ship was stopped quite close to the shore, at the entrance to the north-western passage, which doubtless led to the ocean. I was anxious to land to collect some geological specimens, but it was necessary to manœuvre the vessel all the time, in order to avoid shoals and floating ice, and, besides, the commandant did not see the use of landing here, so I had to give it up. About midnight, Lecointe, who was on duty, saw something floating which appeared exactly like a fragment of wood. This was a good opportunity for launching a boat, so Racovitza, Tollefsen, and I set out to see what it was, and after having found that it was only a piece of ice filled with pebbles and clay, we naturally rowed ashore and landed in a little bay (III. on map, Fig. 2), where I had the good fortune to come upon a moraine, which I believe was a ground moraine. There was water behind the moraine, and then a cliff of ice, the end of a great glacier which covered the whole slope of the mountain. Although it was growing very dark and the specimens were collected hurriedly, we found more than ten different varieties of rocks, but none of sedimentary formation. The pebbles were as a rule perfectly round and usually large, while there were also many big blocks.

Tuesday, January 25, was fine and calm, the air perfectly transparent, the sky cloudless, and the heat of the sun intense. We landed at 7 a.m., Lecointe and Dobrowolski in order to make astronomical observations, Danco for magnetic work, Racovitza to search for plants and animals, Cook to take photographs, and I to collect geological specimens. Amundsen went with us. We landed on the promontory of an island (IV. on map, Fig. 2), and it was not without difficulty that all the delicate instruments were got ashore on the steep rocks. By dint of hard work and by division of labour, we were ready to go on board again by ten o'clock. Lecointe had been able to fix the position of this fourth landing * exactly, and also that of Two Hummocks island, which lay right opposite.

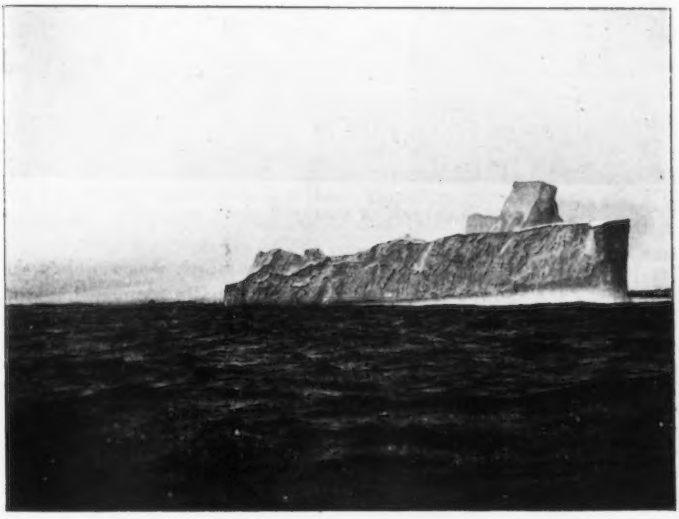


FIG. 3.—A TABULAR ICEBERG.

While Racovitza was studying the patches of moss and lichens which were found here and there on the rocks, the doctor and I made use of Canadian snow-shoes to visit the higher part of the island, and we found them a great aid in crossing the snowy slopes, which were usually gentle, though there were dangerous crevasses in places. A thick mantle of snow stretched to the crest of the promontory and stopped abruptly, the further side being perpendicular. Great blocks of ice must sometimes fall over this precipice. I ventured to cross a longitudinal crevasse, and found myself upon a somewhat unstable mass of

* Lat. 64° 6′ 24″ S., long. 61° 59′ 30″ W. of Greenwich.

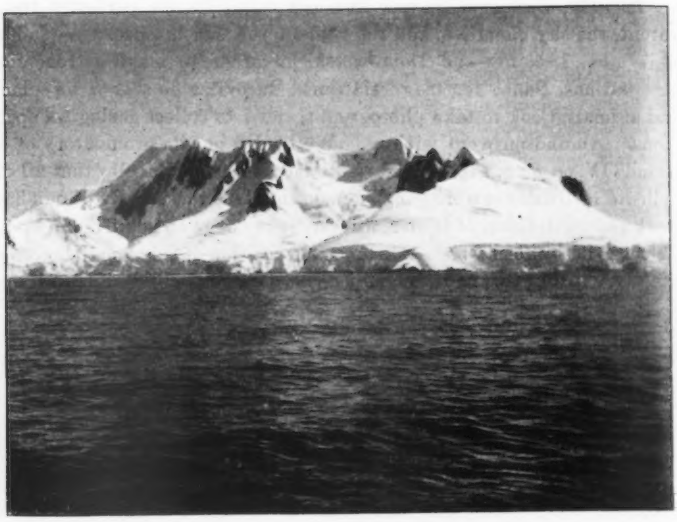


FIG. 4.—GLACIATION OF NORTHERN ISLAND OF PALMER.

ice, poised on the edge of the cliff. A cape which was visible a short distance to the south showed exactly what usually happened. It was too steep for snow to rest upon the seaward slope; but a thick snow-field occupied the top, and numerous vertical furrows marked the places where avalanches had occurred. At the base there was a mass of snow piled against the rocks, its lower portion hardened into ice.

The heat from the sun reflected by the field of snow was so intense that I preferred not to continue the walk with Cook, but sat down in the midst of the silent solitude to allow the grandeur of the magnificent polar landscape to produce its full impression on my mind. To the south and south-east the head of the great bay was formed by a stretch of land extending as far as one could see. It was a region quite alpine in its character, but completely buried by glaciers. The snow-fields rose towards the interior, forming a veritable ice-cap, terminating in a perfectly continuous sky-line. Peaks, mountain ranges, and profound gorges there might be, however they were not to be seen, but lay buried beneath the inland ice. Lower down the relief of the land could be divined beneath its robe of snow, and here and there a bare peak pierced the covering. Nothing like an exposed chain of mountains was to be detected, although near the sea a coast range could be made out, its sides cut by valleys, through which glaciers of various sizes made their way. Along the shore some of the promontories were bare, but on the lower ground the ends of the glaciers were covered by a field

of snow, and were for the most part confluent, forming a platform of ice which gave origin to icebergs. That valleys exist, though they do not show on the surface, is clear from the differences in the size and appearance of the glaciers. The largest are of gentle slope, the smaller steep and broken by numerous crevasses. Some of the glaciers suspended from the cliffs were of extraordinary dimensions. Thus by the appearance of the surface of the ice, and nothing else, one could see that the configuration of the buried land was complicated, and underneath each glacier there must be a great excavated valley, along the bed of which the ice glides downward. The proof of the existence of valleys is very interesting, for it points to a time when there was no ice, but dry land being eroded by the running water of rivers. On the other hand, the thought of these buried valleys brought to my mind the channels of Tierra del Fuego, as they must have appeared in the glacial period, when the end of the Andean chain lay under just such an ice-sheet.

At 11 a.m. we were once more on board the *Belgica*, steering north-east in order to follow and survey the south-east coast of Palmer Land. At 2 p.m. we were opposite a cape where the coast-line changed its direction, and here we made our fifth landing at the head of a little bay where the pebbly boulder-strewn beach sloped so gently that we had to wade ashore, and pull the boat out of the water for safety (V. on map, Fig. 2). The rocks of the beach were erratics from a moraine, and consisted mainly of a grey hornblende granite, but other granites also occurred, especially one with orthoclase. There were also numerous ancient eruptive rocks, some fine boulders of gneiss, as well as quartzites, porphyries, and a metamorphic schist. It was a fascinating problem to consider how so great a variety of rocks came together here. They did not seem to have been carried by floating ice, and two hypotheses suggested themselves: Either the rocks were brought by the glacier which entered the head of the bay, or they dated back to a time when the glacial conditions were very different from those now prevailing. The

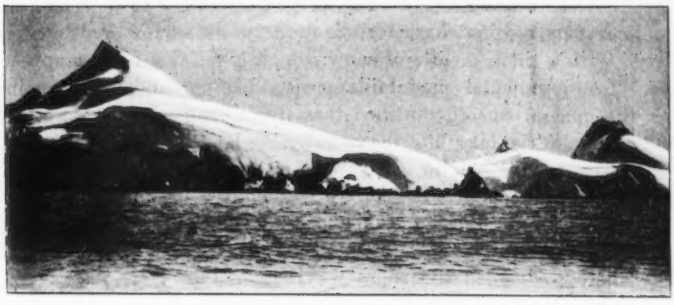


FIG. 5.—THE MOUNT NEAR FIFTH LANDING.

former hypothesis seemed improbable, for the stones were worn, as if they had come from far; although this argument is not a very strong one, since the waves had made their action felt also. On the other hand, the relief of the land was opposed to the formation of an important glacier at this place. The mountains which border the island along which we had been sailing are very near the shore, very steep, sometimes even perpendicular, and their crests are often completely free from ice. Only the lowest part of the flanks of the mountain are covered with suspended glaciers separated from the snow-fields above, and terminating either on the beach or beyond it in the water. Hence the ice which enters the bay cannot come from any great distance, and the material which it carries must be that of which the mountain is composed. Again, the variety of rocks in this moraine is too great to be derived from the neighbouring mountains; they unquestionably come from different places extending over a wide region. Hence, if these rocks are not to be found in Palmer Land, they must come from a southern continent, and have been deposited here as the lateral moraine of a vast glacier which must have filled up the whole of Hughes gulf; and in any case there is evidence of a former great extension of glaciers, that is to say, of a glacial period. Lecointe made an astronomical observation.*

At 4 p.m. we were under way again, steering S. by E. towards the island where we had first landed. The sky was somewhat overcast, at first by flame-shaped cirrus, then by alto-cumulus, the cirrus becoming transformed into cirro-stratus, and finally before sunset a low haze formed on the sea, grew thicker for a while, but shortly after sunset it cleared once more, and we saw the islands and mountains in the south quite distinctly.

Wednesday, January 26, was entirely spent between Two Hummocks island, the island of our first landing, and two groups of islets situated further north. In the afternoon Lecointe, Danco, and Racovitza landed on the island of our first landing in order to make magnetic and astronomical observations, while Cook, Amundsen, and I landed on Two Hummocks island (VI. on map, Fig. 2). Taken as a whole, this island presents a very characteristic form; it is narrow and entirely covered with a thick mantle of snow, which gives it a convex appearance. Two pyramidal mountains project like nunataks, contrasting with the general smooth outline; these two hummocks are ranged in the direction of the length of the island. We landed on the north coast in the hope of being able to climb one of the mountains, and found that the shore was formed by a cliff of ice with only a few promontories of bare rock. I did not see the ice actually immersed in the water at any point; a very narrow strip of bare rock always separated it from the sea. Where we landed the shore was bordered by *roches moutonnées*,

* Lat. 63° 57′ 4″ S., long. 61° 47′ 34″ W.

either awash or rarely rising so much as a yard or two above the surface. A little snow rested even on these rocks, and the sea-leopards were sleeping upon them very tranquilly. Along the coast there are deep crevasses in the ice, so that the cliffs have all the appearance of an icefall. The rock of the island is a grey granite, with thick and very regular veins of a dark and compact green rock, and also smaller red veins. There were some erratics also, but these might very well have been carried by floating ice. In attempting to ascend the island, we were stopped in a fog, when at a height of about 350 feet, by crevasses which we could hardly see, although on returning we were able to make out snow-bridges by which we could have crossed some at least. The crevasses lay parallel to the shore—that is to say, at right angles to the slope. We did not see ice exposed at any place, although in the crevasses there was a fine blue colour, but that this was not necessarily due to ice is shown by the fact that on making a hole about 5 feet deep by driving an alpenstock into the snow, one could see in it a patch of intense blue. The snow was soft, not compact, but agglutinated, although of too small a grain to be called *névé*. As the boat was some time in returning for us, we had to pass several hours on a little patch of rock shut in by white cliffs of ice on either side, which we could not even approach in safety. The clay and sand lying in the hollows contained no trace of animal or vegetable life; there was nothing but bare polished rock, a few pebbles, and in the water some seaweeds and a very few molluscs. The fog cleared in the evening; the boat came at last and took us on board. We continued to survey the islands as we passed, in order to complete the chart of the north of the bay.

On January 27 we landed at 10 a.m. on a little islet not far from Two Hummocks, where there was no snow-covering, though its highest point was 100 feet at least. The islet (VII. on map, Fig. 2) was scored by numerous cracks which cut the rock into lozenge-shaped pieces and covered the surface with angular fragments, the whole resembling the lofty crests of the granitic masses of the Alps. The only snow to be seen remained in the dark recesses of the cracks. The island was a rookery of penguins and cormorants, and in places some guano mixed with clay and birds' feathers was found.

Towards the afternoon the *Belgica* steered south-westerly, and in the evening we entered the large strait stretching towards the south, which turned out to be very wide, and in parts we saw high mountains and great glaciers enclosing the headlands, and in one case at least extending beyond the coast into the sea.

On Friday, January 28, the weather was foggy, and we made a sounding in the centre of the channel, finding a depth of 342 fathoms. We were surrounded by whales (*Balænoptera*), whose blowing could be heard constantly, a mysterious sound to break in upon our solitude as we floated between the grey sky and the dark surface of the sea, on

which they played without paying the least attention to our presence. We approached the coast in order to attempt a landing. Amongst several islets and rocks there was one which presented an appearance of stratification with a slight dip; it was flat and almost completely bare, showing that the snow-line here does not descend to sea-level. We could not see the mountains, for only the lowest part of the coast appeared beneath the clouds. A very large moraine, almost completely bare, was seen running along the shore in a north-east and south-west direction. There was a good deal of floating ice. We saw several places where there were great cliffs of ice with curved indentations, doubtless marking the places where icebergs had broken off; the crevasses on Two Hummocks island represented complete fractures, which only required a slight impulse to launch the detached berg.

At dinner there was a great discussion between Lecointe and de Gerlache as to whether these were islands or a continuous coast—a question of great difficulty, for what with the fog and the uniform white glare without shadow or perspective, it was quite impossible to make out the detail of the land. For geographical purposes an approximate sketch-map is not to be tolerated; it is little use to advance far into an unknown region if all that can be inscribed on the map of the Earth is the track of a ship. Such a result, no doubt, is highly creditable to a navigator, but a scientific expedition ought to have other aims. Lecointe was certainly right to insist that the work which had been commenced must be carried through.

At 2 p.m. we landed on the island one mile from shore, which showed an appearance of stratification (VIII. on map, Fig. 2). It was difficult to get ashore on account of the sea, but when we succeeded we found that the whole surface was a smoothly glaciated rock of eruptive origin, traversed by veins 20 feet thick of a grey compact substance. A little snow remained on the island, but the fog prevented us from continuing our survey, and the wind and sea were rising, so we had to return on board.

On Saturday, January 29, the weather was calm again; the fog had cleared away and revealed a marvellous scene. On every side the thick white covering descended to the sea, and only the steepest slopes were free from snow; perpendicular cliffs and steep hill sides were characteristic of all these coasts. A cliff which bordered a submerged valley where an immense glacier debouched showed an appearance of vertical stratification, but our ninth landing enabled us to prove that this appearance was due merely to cracks in the rock, as in all previous cases. This may possibly be an effect of extreme cold, for the *roches moutonnées*, which are preserved from abrupt changes of temperature by snow covering them most of the year, do not exhibit such cracks, or only to a slight extent. It was a curious landscape in white, grey, and black, yet with plenty of light, although the sun was hidden, and a

wonderful play of shadow. Photographs can say nothing as to the complex tints, while painting often exaggerates them; only an exceptionally good colourist could record the delicacy of the tones. My Russian friend Pokhitonow would make an admirable picture of this landscape, so imposing by its severity. The sea was very dark, slightly greenish in the foreground; the horizon loaded with black and grey stratified clouds, and in the whiteness of the stratus above there was a yellowish tinge. The snow was very white, and the glaciers of a white just faintly bluish towards the base, and in the cracks and below there was the blue of the water; the rock was black, in places touched with brown, and lines of yellowish grey; the clouds, merely elevated fogs, encroached upon the summits of the mountains, gradually thickening upwards.

In the afternoon, while waiting for the sun and a wider view, we landed on a floating cake of ice in order to obtain a supply of fresh water.

At 5 o'clock we landed for the ninth time at the foot of a perpendicular rock, elsewhere a high cliff of stratified snow passing gradually into ice in its lower part, made landing impossible (IX. on map, Fig. 2). The crevasses, which form parallel to the shore, cut this wall of ice into sections. The head of the little bay which we had entered was occupied by the front of a large glacier, which terminated in a *mer de glace;* and here we were happy enough to be present at the formation of a very little iceberg—a great block of ice which tumbled into the water with much noise, raising a cloud of dust from the ice, and starting a series of waves across the bay not large enough to hurt our boat. This glacier rises slowly towards the south, and its mountainous border runs north and south. A very characteristic island resembling Two Hummocks lay in front of us. In the evening, as we were still in the same neighbourhood, I made a drawing to show some large curved crevasses which were very sharply marked, and proved that the ice flowed most readily in a direction at right angles to them. Except for two mountain peaks, the island is completely buried under a thick layer of ice, which is undoubtedly a glacier, and, though differing in appearance from valley glaciers or suspended glaciers, is nevertheless subject to the same laws (Fig. 6).

The night was fine, and the *Belgica* remained in the same position in order to get her bearings next day. The sea extended to a distance towards the south and east of the prominent headland, where our ninth landing was made; there was evidently a great bay, and possibly a passage, but the way seemed to be closed by lofty mountains with majestic peaks. Towards the north-east was the channel which we had undoubtedly entered in too great a hurry, and we had to return on our track in order to make a connection with the land previously discovered. There was also a passage in the north-west, but my attention

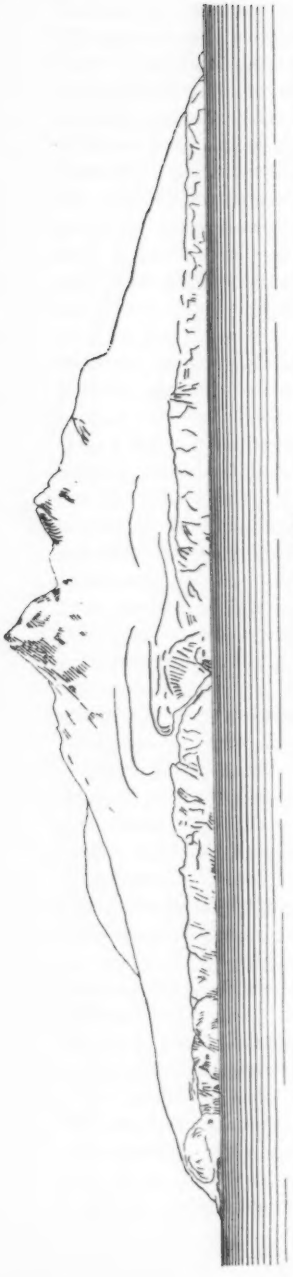


FIG. 6.—TWO HUMMOCKS ISLAND.

was particularly attracted by the fine mountain summits of the large island which lay to the north of our position. While pacing the deck with Lecointe, I pointed out to him a place where I thought a landing might be made, and we discussed the possibility of an attempt to climb the mountains. In the distance a gentle and very regular slope could be seen stretching up to one of the peaks, attaining an elevation of about 7000 feet, and it seemed quite possible to ascend in this way and from the summit to sketch the outlines of the land very easily, and obtain a general idea of its configuration. Lecointe was prepared to adopt Admiral Mouchez' method of surveying by utilizing the height as a base, and fixing the distance of points on the coast by measuring the angle with the vertical. Cook was ready to accompany us, and Amundsen did not wish to be left behind.

On Sunday, January 30, we steered north-north-east, in order to land at the foot of the mountains of our ambition. The commandant decided to accompany the land-party, but in that case the *Belgica* would be left without officers, to which Racovitza objected. Lecointe consequently had to remain on board, and Danco, who was to come with us, undertook the theodolite work; but the preparations which had to be made were too elaborate, and the projected excursion was doomed to failure before it started. In order to succeed, it would be necessary to carry supplies on our backs and make a great and sustained effort, being prepared, if the route was bad, to return and choose a better way, for at present we could no longer see the gentle slope which had been visible from a distance, and it was by no means certain that the point at which we were to land would turn out a favourable one. We took with us two sledges of Nansen's pattern, sleeping-bags, a silk shelter tent, a little

aluminium stove, such as was used by Jackson, Norwegian *ski*, Canadian snow-shoes, ice-axes, a 40-foot rope of raw silk, provisions for a fortnight, even changes of underclothing, and all the instruments after that. Certainly there was far too much baggage, and we were not likely to go so far during the eight days we intended to pass in the glacier; still, there was no knowing whether we should not find something interesting to observe. We landed on a little promontory at the head of a fine bay, where a large glacier entered the sea and the snow lay down to the water's edge (X. on map, Fig. 2). There was no difficulty in getting ashore, but the sledges were horribly heavy. Lecointe, Tollefsen, and Johansen helped us to make a start, and then we continued by ourselves, a party of five, de Gerlache, Danco, Amundsen, Cook, and I. The *Belgica* left the bay to continue her surveys in the south, and to return for us later. At a height between 400 and 600 feet we had to cross several crevasses, which were narrow and spanned by snow-bridges solid enough to allow our loads to pass without difficulty. Higher up a great snow-field stretched before us, whence we could look down upon the glacier which cascaded towards the bay. The ice from this dislocated glacier could only break off in small pieces, so that we recognized that the essential condition for the formation of icebergs is a slope gradual enough to prevent the formation of a *mer de glace* at the extremity. The night passed comfortably, though we were too tightly packed in our tent. After breakfasting on the everlasting oatmeal, we set out with our loads, but it was too foggy to allow of much progress being made. While waiting for the fog to lift we pitched camp for the second time, and no sooner had we done so than the weather became fine.

Cook and I set out for a reconnaissance upon the glacier, which formed a continuous plateau rising gradually towards the interior of the island, where two mountain summits rose above the snow. The conditions appeared to be most favourable towards the north-west, and the whole party set out with the sledges in that direction, and we encountered only a few small crevasses, which were easily crossed, then the slope began to increase At 2.30 p.m., during lunch, I placed the black-bulb thermometers on the snow, and, although the sun was slightly veiled, they showed readings of 102°·6 and 86° Fahr., although the temperature of the air, measured by a sling thermometer, was only 34°·2. The strength of the solar radiation made us all feel very warm. We enjoyed a very extensive view towards the south, and saw the high mountains on the opposite side of the strait diminishing gradually in height towards the east; the direction of the chain seemed to be north-east and south-west. The whole of this mountainous region seems to have subsided, but if the west of these lands has sunk, it may be that there is a large plain of upraised land to the east, the low relief of which would cause the glaciers to be prolonged into the sea, and in such conditions icebergs formed upon the continental shelf itself might attain a

great size. Here, on the contrary, most of the coastal glaciers are of a different type, terminating at the level of the sea. At 7 p.m. we were still mounting upwards, the weather being remarkably fine, and the view of Graham Land grew finer and finer. The relief of that land, although excessively varied, is singularly softened by the glaciers and the accumulated snow, so that it is only because the valleys hollowed by the running water of some epoch are so deep that some crests and very abrupt slopes remain bare. At the height of 1600 feet we were stopped by a crevasse over 30 feet wide, which we could not cross, and other crevasses appeared beyond it, the whole glacier having a terraced structure. We had consequently to descend again to the ice-plain in order to camp for the night. During the whole of Tuesday we were dragging our loads uselessly towards a hill in the west, but in that direction also we were stopped by numerous crevasses, and in any case, if we had reached the hill we should only have been able to see a part of the horizon. Again we had to retrace our steps to the ice-plain to pass the night, and there we left our camp for the two following days, seeing that it was impossible to reach any high summit. We climbed two nunataks in the east, one of which was easily ascended, and on it Danco and de Gerlache made observations with the theodolite. The minimum temperature of the night between Tuesday and Wednesday was 25°·5 Fahr., and between Thursday and Friday 24°·6 Fahr.

The radiation from the sun during the three days had not sufficed to change the snow into *névé*. On Friday I went over the whole of the plain, and found snow at the surface everywhere, but at a depth of 4 inches there was frozen *névé*. The plain, upon which we camped, is the result of the complete filling of the valley; for it is certainly a valley which descends from these heights, but it is very difficult to give the orography of the lower parts, as the glacier and the accumulation of the eternal snow hid the form of the land. The formation of the ice, however, showed me that the nunataks are the summits of the sides of the valley, and the cascade that we vainly tried to cross is the step which would have led us to another plain of ice, covering a second terrace of the same valley. Amundsen and Cook tried to pass the crevasses by climbing along the walls of rock which bordered that section of the glacier in places, but they were unable to reach their goal.

From the summit of the more distant nunatak Cook and I had a good view of the *mer de glace* in which a large glacier terminated at the head of the bay where we landed; although the broken fragments could not give rise to icebergs as they entered the water, it seemed quite possible that in winter, when the bay is frozen enough, ice might accumulate to form one or more bergs. In any case, it appeared certain to me that the bottom of this great valley extended below the level of the sea; and I was also led to believe, judging from the distances which separated the nunataks and the angle of slope of the walls, that the same holds

good for the valley in which we were camped. We found some lichens and mosses on the nunataks.

On Saturday night we heard the *Belgica* return, and on the morning of Sunday, February 5, we heard her whistle again. We could not go on board, however, because the wind was blowing too strong, and Amundsen, who went to look out, saw the ship leaving the bay. We changed our camp, and as the wind was always tearing the tent, we were obliged to protect it by a wall of snow.

On Sunday afternoon we all got on board the *Belgica*, and found that Lecointe and Racovitza had made two landings in our absence. We steered towards the east, in order to continue our survey of the coast of Graham Land. The air-temperature was high all day, with a maximum of 45° Fahr. At night it rained, at times very heavily, and it must have produced a great effect upon the snow-fields, because we noticed in descending the plateau that the snow had considerably changed its appearance, and we sank deeply in the porous mass. The rain must have produced a much greater effect than a day of strong sunshine.

On Monday, February 7, the sky was overcast, but the weather was clear and the sea calm, and we passed quickly along the southern coast close inshore. The coast was very remarkable, on account of its great indentations. Hughes gulf was followed by a bay, which we had rapidly sailed round, and then came another still larger, of which we followed the shore; but further south Lecointe found yet another bay, in which very large glaciers terminated. We passed so close to the shore that we could not see the high mountains in the interior of the country, but only the ends of the glaciers coming from the inland ice. On the other hand, we could study in detail the innumerable glaciers which are attached to the flanks of the mountains bordering the strait. The rocks are very steep, and in many places exposed to view, but too often in inaccessible positions. We succeeded, however, in landing at the base of a granitic cliff, near which, upon a little promontory, I discovered a metamorphic schist in contact with the granite (XIII. on map, Fig. 2). The direction of the strata was north-west and south-east, and their dip towards the north was about 45°; a very friable schist alternated with a dark quartzite, and dark green strata of a highly metamorphosed rock. The granite is below, *i.e.* in the south, and forms a mountain, close against which is a mountain of dark rock, quite inaccessible except for one cliff, at the base of which I was able to risk myself. The stratification seemed much straighter above than at sea-level. From midday the weather was bad, with rain, snow, and fog, but at night it grew finer.

On Thursday morning I went up in the crow's-nest in order to photograph with my binocular camera the three-quarters of the horizon from north to west. It was splendid weather, and here one was absolutely alone, with nothing and no one to distract the attention.

Even from the mast-head it was impossible to see far into the interior of the land; only the first wall of the mountains was visible. The region in which we now were seemed to be much less buried in ice than the land at the head of Hughes gulf, and the glaciers appeared to be local, coming from no distance in the interior. It is also noteworthy that here the peaks rising as nunataks and the walls of rock bordering the glaciers are sharp, and only rounded by ice-action for the 500 feet nearest the sea. In the neighbourhood of a great glacier coming from the south, where the twelfth landing was made by Racovitza and Lecointe, there was a very large *roche moutonnée* in front of the end of the glacier, which is evidently retreating. A little further to the north of that point I saw a nunatak, at the base of which the ice seemed also to be retreating. On the northern side a very characteristic curvature (*a*, Fig. 7), with a smoothed surface, was remarked near the snow, while there were large vertical grooves above. I saw very few examples of this kind; as a rule the nunataks were well buried.

FIG. 7.—NUNATAK, AT THE BASE OF WHICH THE ICE WAS RETREATING.

The tenth landing (X. on map, Fig. 2) was on a large island. I saw the channel which separates it in the south-west from another land, and to the north-west the sea horizon was unbroken — it was the Pacific ocean. I saw this confirmation of my theories* with much pleasure; there was no doubt that we were on the west coast of the continental land symmetrically placed with regard to the Southern Andes. There is no passage to the east, and the Biscoe islands form a parallel chain belonging to the mountain system of Graham Land.

We continued to approach the north-west coast, our course being west-south-west. I noticed a wall forming a little cirque between two promontories, at the foot of which a broad glacier terminated abruptly along the shore and stretched upwards towards the mountains in a gentle slope. A series of curved lines, more or less parallel, could be distinctly seen upon this wall; the last of them followed the outline of the field of *névé*. There were ledges of the rock ranged like steps; the

* *Bull. Soc. Géol. France*, 1895, p. 590.

snow lying on the flat shelves contrasted with the dark colour of the steep slopes and emphasized the structure. The same thing was seen in other places where similar conditions prevailed, and it seemed that these steps were old levels of the snow-field, and their existence proves a former greater extension of the *névé*. While the *névé* remained at one level, the exposed portion of the rock wall crumbled under the influence of atmospheric agencies, while the part covered by snow was protected, hence the cutting of the step.

At noon, Lecointe, Danco, Racovitza, Amundsen, and I landed with the instruments necessary for astronomical and magnetic observations; but, unfortunately, we were too late to observe the meridian altitude, a misfortune the more regrettable because Lecointe had urged

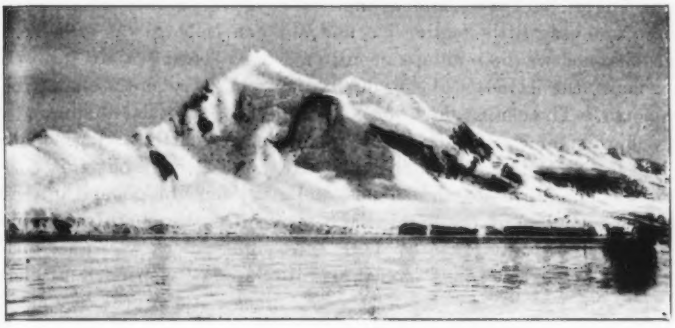


FIG. 8.—MOUNT WILLIAM.

the commandant to allow us to land sooner. We remained some time on the strip of bare rock which was exposed between the field of *névé* and the sea. It was the same black granitoid rock traversed by thick veins and narrow threads of quartz; and there was a great variety of erratic blocks, including specimens of basalt, breccia, several blocks of conglomerate, and some fragments of quartzite. A cave was found in the large-grained porous ice-wall, along the uncovered bed of which a little stream flowed, the first glacier stream I had seen. It came from the direction of a nunatak, and consequently could not have pursued its course to a long distance under the ice; in its bed there were rolled pebbles of eruptive rocks. We were only two hours ashore, so it was impossible to get as far as the nunatak. At our landing-place, and for some distance out from the shore, we saw the bottom of the sea very distinctly, and in some places could even touch it with the oars, it was composed of pebbles and boulders.

At 5 p.m. the *Belgica* resumed her voyage southward, and we entered a channel which narrowed as we proceeded. The mountains on the

right became lower and their profiles sharper, while on the island to the east of us I saw the snow-fields on the summits merging one into the other, and forming plateaux of ice. A little sierra, composed of five or six peaks in a row, ran in a north-east and south-west direction, and as we were abreast of the first mountain, it presented itself to us as an abrupt wall of rock, the screes at its base partly buried by snow. The other summits further south were much higher. The channel itself had the appearance of a fjord, but there were no mountains at the end, only a low snow-field, and signs of a passage towards the west. As we advanced, the mountain chain on the right became clearer; in the west there was only one high mountain,* and beyond it doubtless the ocean. The sierra on the left showed no trace of stratification. At 7 p.m. we found that the channel curved towards the west almost at right angles, and we entered another channel parallel to the first. There was very little floating ice, and not one iceberg was to be seen. The channel we had entered continued as a great valley into the interior of the island, a glacier descending along its gentle slope from the north. The chain which formed the mass of the island culminated in a high summit entirely snow-covered in the north, and gradually fell off to the south. It would really take years to work out this complex of channels, inlets, and islands, and many facts of general interest would be elicited if the archipelago were to be thoroughly mapped.

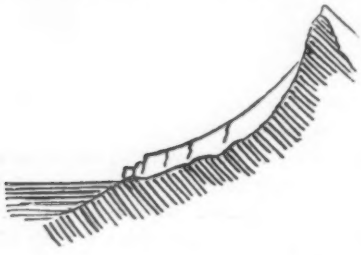


FIG. 9.—SECTION OF SUSPENDED GLACIER.

At eight o'clock we passed some of the flat suspended glaciers characteristic of the island on our left, and a diagrammatic section of one of these is given in Fig. 9. They have always the long crevasses, sometimes slightly curved, with detached berg splinters. The general appearance of these coastal glaciers is a great mass of snow heavily heaped against the mountain. The surface has a slope far too gentle to produce the effect of a suspended glacier of the Alps, or even of the channels of Tierra del Fuego. The sun set in an orange-tinted horizon, the sky above being intensely blue with little golden clouds, and the mountains facing the sunset flushed pink and changed to red. It would be difficult to imagine any place more beautiful in such perfect weather; the everlasting ice, the grim mountains, and the majestic silence combined to impress the mind with an overmastering sense of the calm severity of nature. Alone in the crow's nest, I rejoiced at my

* Biscoe's Mount William.

good fortune in attaining so great a reward for my voyage as this feast of grandeur and beauty.

On Wednesday, February 9, at 7.30 a.m., we made our fifteenth landing (XV. on map, Fig. 2). The whole coast appeared like one great *roche moutonnée* entirely free from snow, everywhere smoothly polished and scored with sharp grooves, often very deep, running in all directions and crossing each other. The larger were vacant, but others were filled with thin leaves of rock, and some with compact grey veins, giving the rock a schistose appearance. The surface of the granite was strewn with splinters split off by the effects of radiation, usually from one-third to two-thirds of an inch thick, and about a foot in diameter. There were no erratic blocks. The rocks were bare up to a height of about 150 feet, but from this level the snow uniformly covered the island. The sheet of snow gave rise to a trickle of water, forming cascades, under which an abundant vegetation of mosses and algæ had accumulated. A few tufts of moss were found here and there among the stones. The sun shone strongly, and the bare rock grew quite warm. At 8 a.m. on the *Belgica*, when the air-temperature was 41° Fahr., the black-bulb thermometer in the sun read 87°·8, hence the splintering of the surface of the rocks could easily be understood.

At ten o'clock we were on board again, heading south out of the channel, and as we passed along the coast I saw several semi-cylindrical ice-caves from which streams issued, but the tunnels were small compared to the great mass of the ice. At 10.30 we passed the cape at the south end of the mountainous island we had been coasting, and the recording thermometer fell, while the hygrometer rose sharply, as the influence of the ocean made itself felt; and in the distance great icebergs could be seen in the open Pacific. I counted a group of twelve small low islands, mere domes of snow bordering the large island in the south-west; and at eleven o'clock we made the sixteenth landing on one of them (XVI. on map, Fig. 2). Lecointe landed for the noon observation of the sun, making use, as before, of an artificial horizon; Racovitza, Cook, Danco, and I accompanied him. The whole islet was covered with moist snow almost to the water's edge; it was strange to see so great a difference in the height of the snow-line in so short a distance as that separating the XV. and XVI. landings.

These low islets are more exposed to the humid winds from the western ocean, and consequently receive a greater precipitation, the snow not all melting in summer. On the snow we found penguins' feathers, shells carried by the birds, and all sorts of dirt, producing hollows by absorbing heat from the sun, and sometimes these holes were rather deep. The *névé*, which was all oozing with water, was compact at a trifling depth, where it changed into ice. The ice-cap of this islet was crossed by a single narrow crevasse. The rocks round the edge were all iceworn and very flat, in some places scored with cracks, though

to a much less extent than at the place of our previous landing. There were numerous veins of quartz, some quartz in the form of amethyst, and a quantity of copper ore. There were no erratics. All the islets of the neighbourhood had the same appearance, like great whale-backs appearing above the sea. The polished surface extended to just below the surface of the water, and there were also, near the islet where we landed, several glaciated rocks scarcely emergent.

The whole group seems to form a plateau which has been profoundly glaciated, and of which only the higher portions now appear, but this plateau has nothing in common with the continental shelf, the whole of the district which we have explored presenting very clear evidence of a submerged region. From another point of view, these islands are by no means the stumps of mountains worn down by marine erosion; they afford evidence of a great extension of glaciers in some by-gone period. The whole channel, which we were now about to leave, had doubtless at one time been filled by a great glacier which flowed to the Pacific. The cutting off of the summits of these islands may be its work.

At 3 p.m. we turned the southern point of the sierra and steered north-eastward in order to continue our exploration of the main channel, which is divided by low islands into several branches. It is a question of some interest whether it is the Bismarck strait of Dallmann. The sierra reappeared suddenly in the south, on the other side of the entrance to the channel, and continued in a straight line to the south south-west, but a lower parallel ridge appeared west of the main chain, and beyond it a range of islands, the summits of which were still lower, bordered the coast, the whole evidently forming a tectonic chain. Towards the interior a gentle slope of glacier connects the sierra with a higher mass buried under the inland ice. At 4 p.m. we made the seventeenth landing on an islet not far from the east coast of the island we had come round (XVII. on map, Fig. 2). Racovitza, Cook, Danco, and I were left ashore for some hours while the ship continued her route. The end of the island where we landed was a great rookery of penguins and cormorants, and the snow was much soiled for a considerable distance from the shore. The rocks, which are much glaciated, were fairly level, and at the heads of the little bays out of reach of the waves we found numerous pebbles and small erratic blocks of gneiss, various granites, and porphyry, but neither pudding-stones nor basalt; and as I saw no erratics elsewhere, it is probable that these were carried by floating ice. A rocky hill was uncovered to a height of 70 to 100 feet, and above that was the layer of ice, which, in places of more gentle slope, descended to the shore. There was little *névé* on the surface, and all of it melting; water trickled away on every side, though not in any great quantity. The surface of the ice was traversed by vertical cracks, running in different directions, and varying from $\frac{1}{2}$ to 1 inch in width. While the crevasses had vertical sides and were hung with icicles, these

narrow cracks were full of water. This mosaic of cracks occurs on the top of the boss of ice which forms the summit, while on the slopes the crevasses assume a transverse direction, being evidently produced by the tension of the ice as it creeps downwards on every side towards the sea. One main crevasse ran along the whole length of the back of the island. On the side where we landed the ice-covering was pierced by a few scarcely visible points of rock, while the whole southern shore was bordered by a cliff of ice. Another island, similar in every way to the one on which we landed, lay quite near, and on it also

FIG. 10.—ANTARCTIC ISLAND COVERED BY AN ICE-CAP.

streams of water were trickling from the ice. I made a sketch of this island, which is shown in Fig. 10.

From the eastern side the sierra had a much more gentle slope. The cirques in the crest were occupied by very steep glaciers, but lower down the wide snow-fields reduced the slopes to a very gentle gradient. The rocky walls so characteristic of the north-west of the sierra, as seen from the other side of the island, were not represented at all on this. On the northern slopes of Graham Land, on the other side of the wide channel, I saw an immense glacier descending the gentle slopes from the snow-fields which lay about the heights situated in the south-west. It was really a majestic ice-stream filling two large valleys for three-quarters of their depth, while higher up it completely drowned the rocky spur that separated them.

With Cook I walked round our islet, and at its northern end found several fragments of moraines plastered against the slope nearly 80 feet above the level of the sea, and from 15 to 25 feet in height. They contained the same gneiss, granites, and other rocks collected in the little bays of the shore. The predominant rock was granite with hornblende, in fragments which were often angular; the blocks of gneiss were often very large and perfectly polished. Since the granite with orthoclase only occurs in the form of well-rounded pebbles, it doubtless has come from a distance, and the same is true of other rocks. The moraine descends very slightly towards the west, and its direction is that of the channel. This moraine is another decisive proof of the existence of a glacial period in the neighbourhood of Graham Land. In the evening the sky became overcast, the wind rose, and it grew

very cold as we waited for the *Belgica*, which at last returned for us about 9 p.m.

Thursday, February 10, was cloudy and slightly foggy, and for a time we could scarcely see where we were amongst the numerous islands, with the low clouds concealing the characteristic mountain outlines. At noon we made the eighteenth landing, almost opposite the seventeenth, on the other side of the large channel (XVIII. on map, Fig. 2). It was at the base of a pyramidal mountain of red rock, very different in appearance from the surrounding scenery. A great band of red granite seemed to traverse the region from north-north-west to south-south-east. The interesting feature of this landing was the discovery of a moraine at least 70 feet in height, which was set against the mountain-side along part of the beach in the direction of the channel. The rock itself was highly glaciated to just below the level of the water.

The boulders were mainly angular fragments of red granite, and, on the crest of the moraine, numerous blocks of well-polished gneiss. There were also pebbles of hornblende-granite, porphyry, and other rocks, including a white quartzite with small crystals of pyrite, and a very compact black schist. Since we were always in sight of the coast, I never ceased to ask for more landings; I urged Lecointe, de Gerlache, and the others again and again, but not with so much effect as I could wish. The commandant showed himself very obliging; but with a little good-will we could have landed in many other places and collected much more geological material than we did. For this eighteenth landing he conducted me himself, but for ten minutes only. A few strokes of the oars brought us to the beach amid cries of "Hurry up, Arçtowski!" I gave a hammer to Tellefsen, with orders to chip here and there down by the shore, while I hurriedly climbed the moraine, picking up specimens as I ran, took the direction with my compass, glanced to the left and right, and hurried down again full speed to get a look at the rock *in situ;* meanwhile Cook had taken a photograph of the place from the ship—and that is the way geological surveys had to be carried out in the antarctic.

At 4 p.m. we passed a fine iceberg, which appeared like the face of a glacier, and must have been recently detached, for it still bore the marks of crevasses. It was about 100 feet high by nearly 700 long.

At 5 p.m. I was again in the crow's nest, and we were heading south-east, perhaps to cut another slice off the northern end of Graham Land. It was not clear, but we could make out enough to recognize landmarks. What seemed to be a channel turned out merely a wide fjord which got slightly narrower towards the head. The amount of floating ice and icebergs increased; some of the latter were over 500 yards, and one was certainly over 1100 yards, in length. Although there was no sunshine, we heard the thunder of the avalanches from the land. In the north-east we saw the front of a very large glacier, but

the upper part was swathed in cloud. At the head of the fjord there were no rocks to be seen; a wall of ice met the water all round—the nature of it, however, was not quite the same at every point.

On Friday morning at 9 o'clock we made the nineteenth landing on a little islet, or rather a big *roche moutonnée* under a great shield of snow, rising gently from the water (XIX. on map, Fig. 2). The strip of bare rock between sea and snow reached only 2 or 3 yards above the level of the water, and was remarkably smooth and glossy. There were two islets of this kind, and between them a moraine just appeared above the sea; it consisted of very large blocks of rock, probably diverse, but I could not get to see them. Lecointe, who landed for an observation on this island, was certainly very hard pressed for time.

The weather cleared a little in the afternoon, and we continued to search for a passage to the east, but there was none—it was merely a fjord. I only caught a glimpse, in a clear moment, of one of the lofty summits which must exist to the east, from which the great glaciers flow. From the head of the fjord valleys radiate inland like fingers from a hand, each filled by a great glacier. Some of the glaciers at the head of this fjord were very large; descending by an easy gradient, they formed a broad flat base, which launched great table-topped bergs of much regularity. In turning to the west after completing our circuit, we met more floating ice. About 6 p.m. we were surrounded by ice, and in fog, which remained at some little height above the water. Here we observed a strange and very beautiful phenomenon. At a given moment the ice suddenly assumed an intense blue colour, of extraordinary purity, a little tinged with purple near the horizon, and becoming lighter higher up, changing into a steely tint above, but showing no trace of green. Fog and ice were coloured alike, hence they must both have been illuminated by blue light. In the south-west, about 15° above the horizon, the blue disappeared and was succeeded by a luminous steel-grey sky, and above this white light a yellowish stratum faded off upwards into a faint orange glow, and finally, beyond 25° above the horizon, the whole sky was a dull grey mass of cloud. The phenomenon was at its maximum intensity about 7 p.m., when the sun was 18° 30′ above the horizon, and at eight o'clock it had become very faint. The air was clear enough to allow us to see floating ice a mile away. Soon after eight the fog closed in again, and when going dead slow the *Belgica* collided with a small berg, but the shock was not severe, although the bow-sprit was damaged.

On Saturday, February 12, a good deal of floating ice was in sight in pieces of all sizes, and there was a little field-ice. The sky cleared and high mountains appeared in the south. At 9 a.m. two rocky points loomed out of the mist, and there seemed to be a passage between them. We followed the coast very closely, and soon found ourselves in a bay, on leaving which we admired a very fine cape which rose in two lofty

needles (Fig. 11). It was the most westerly promontory of this part of Graham Land, for the coast changed its direction here and turned towards the south-south-west. We rounded this point, and left for the time the strait which connects Hughes gulf and the Pacific.

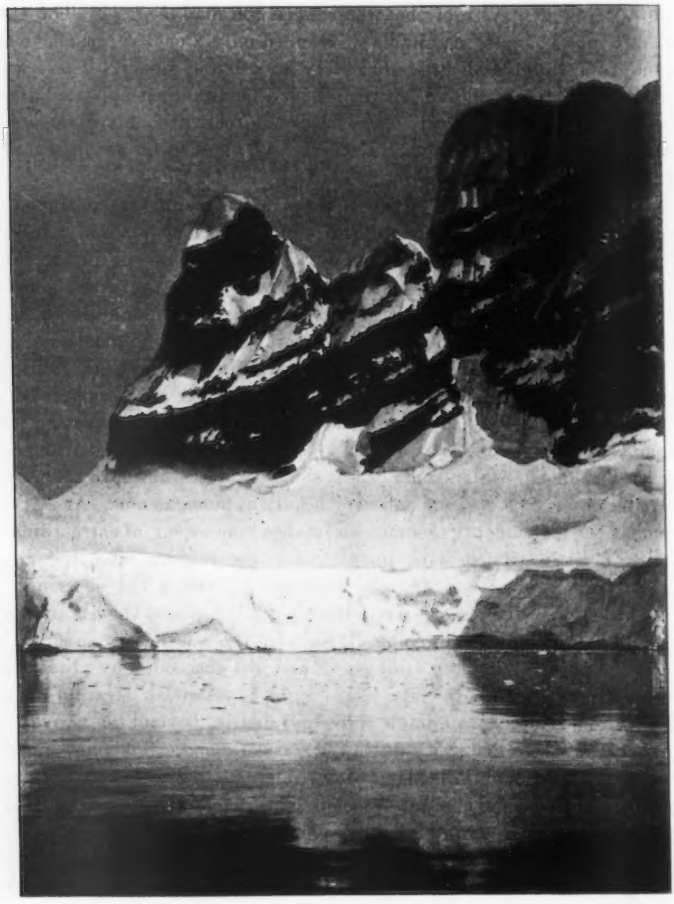


FIG. 11.—ONE OF THE NEEDLES FORMING THE NORTHERN EXTREMITY OF GRAHAM LAND (DISCOVERED BY BISCOE).

At 10 a.m. we made our twentieth landing on the Pacific slope of the Needles, which form the northern cape of Graham Land, to make magnetic and astronomical observations and collect what objects of interest we could find. This landing-place (XX. on map, Fig. 2)

was quite similar to that on the coast west of the sierra. In places the beach was quite free from snow; elsewhere there were little glaciers clinging to the slopes of the mountain and terminating seawards in cliffs of ice. The steep rocky slopes above were absolutely bare up to a height of 700 or 1000 feet, and beyond that rose fields of *névé*. Cook and I climbed a little ridge running at right angles to the range of the Needles. An inclined plain of snow, interrupted here and there in the upper part by transverse crevasses, which were easily crossed, led us to the rocky wall, which there was no difficulty in climbing, thanks to the numerous joints widened by weathering so as to cut up the face of rock into superimposed blocks, and thanks also to the narrow chimneys down which the *débris* of the rock slipped. It is remarkable that these rocks remained quite bare at an elevation far above the snow-line. It is not sufficiently accounted for by the steepness of the slope, though that would make it possible for only a small quantity of snow to accumulate; but the dark walls were so strongly heated by the sun that the snow was actually melted. In making the ascent we found that the low cloud, so characteristic of these regions, was very thin and level on both sides. We passed through the belt of mist between the altitudes of 150 and 300 feet, and above that there was an absolutely clear sky and dazzling sunshine, while at our feet the cloud extended as a smooth grey sea. If such a condition often occurs, it is easy to see how the higher rocks become free of snow in summer, while those near sea-level remain covered. At 3 p.m. the mist cleared completely from the side of the land, and we were able to proceed, passing through a narrow and beautiful sound which separated a group

FIG. 12.—THE NEEDLES, SEEN FROM THE PACIFIC.

of islands from the coast. The mountains rose almost perpendicularly at various points, and on the rocks I again noticed parallel lines following the outline of the tops of the small coast glaciers (*a*, *a*, *a* on Fig. 5; *c*, *c* are crevasses).

The *Belgica* passed on, steering south. It was a pity to leave this most interesting region, where we could so easily collect quantities of valuable scientific material, and of which we could have made a complete geographical study, now that the outlines of the great strait had been charted. We ran close along the coast of Graham Land, noting that many islets and rocks extended to a considerable distance from the shore. Many icebergs were met, and we also encountered a good deal of sea-ice. At 8 p.m. we passed several typical table-bergs, large, flat-topped, rectangular, the ice stratified horizontally with great regularity, and only a few narrow vertical crevasses to be seen. They rose about 50 feet out of the water; about 40 feet consisted of ice as white as the *névé* which capped it; compact ice was only seen near the base. Just in the line of the three icebergs of this kind which we saw, we found an enormous flat glacier spreading to the sea without any interruption in the form of an ice-fall.

FIG. 13.—MARKS ON ROCKS ABOVE GLACIERS.

On Sunday, February 13, the coast was so encumbered with ice that we had to keep out to sea towards the Biscoe islands. About 11 a.m. we traversed a little light pack-ice, and passed near some table-bergs. The melting sea-ice had a dirty yellow colour, and on examining the melted ice under the microscope, Racovitza found it swarming with diatoms. We remained in sight of the coast, and more small islands appeared. At 5 p.m. we sighted a number of fantastic icebergs, amongst which I saw many transitional forms between the table-bergs and the peaked arctic forms. I made drawings of four of them (Fig. 14). The sea was rough, and the breakers dashed against the shore and the icebergs. About 8.30 p.m. we were in the midst of a labyrinth of rocks, and there were also several low snow-covered islands in sight. At 10 p.m. the *Belgica* was in a very uncomfortable situation, threading her way between rocks on every side, on which a heavy sea was breaking: the position was about 65° 10′ S., 64° 50′ W.

On Monday, February 14, the sea was free from ice, except for bergs, many of which were in sight. We steered south-west, in the direction of a strong ice-blink; a less marked ice-blink appeared also

in the east. During the day we designedly sailed over the position assigned to the Biscoe islands in the Admiralty Charts, which seem to have adopted a position so far from Graham Land by making an error of one degree in each co-ordinate; thus Pitt island is shown in 65° 20′ S. and 65° 40′ W., while Biscoe gave its position * as 66° 20′ and 66° 38′ W.

On Tuesday, February 15, continuing her south-westerly course, the *Belgica* crossed the antarctic circle. During Wednesday, February 16, we tried to approach Alexander Land, which, however, proved to

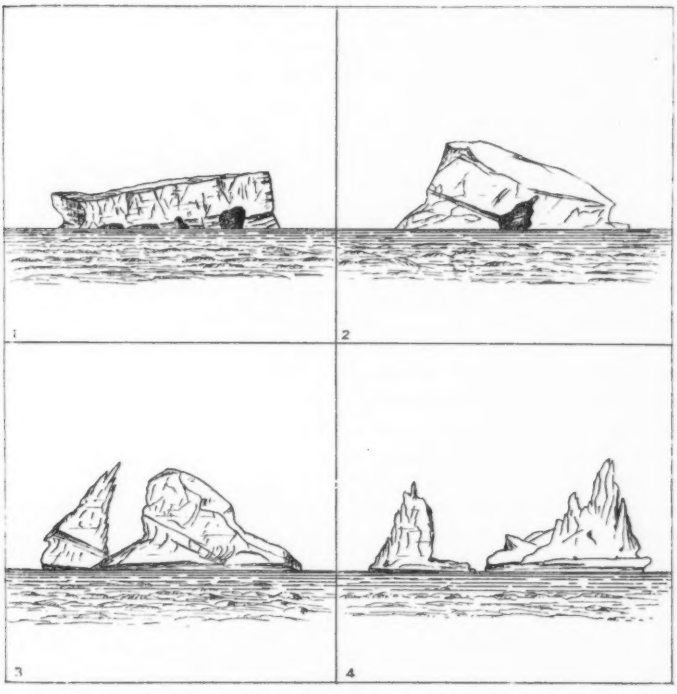


FIG. 14.—ANTARCTIC ICEBERGS, SHOWING TRANSITIONAL FORMS.

be inaccessible on account of the pack. At a distance of at least 20 miles from the land we obtained a sounding of 74 fathoms, with a rocky bottom, doubtless the shoal formed by the destruction of some former island by marine and glacial erosion. In the evening the sky became quite clear, and we were able to see a large island in the east, and the extremity of Alexander Land. The island seemed to

* *Journal Royal Geographical Society*, February 11, 1833. The position as given in Biscoe's MS. log-book is, however, 65° 20′ S. and 66° 38′ W.

mark the termination of Graham Land, for the coast beyond it seemed to turn towards the east. It may be, therefore, that there is a strait, or at least a gulf, between the two lands. We could not say positively that we saw the south coast of Graham Land, because the distance was too great. The island formed a mountain chain with many valleys entirely filled with glaciers, but the forms of the mountains were not those of the north. I saw no sharp crests; there were rather great pyramidal masses, their lower slopes having the appearance of terraces, no doubt hills buried in snow. All round the island a great plain of ice sloped outwards, and merged into the surrounding pack. Alexander Land, in the south, was a mountainous aggregate over which very lofty peaks rose majestically; it tended north and south, and was lost to view vaguely on the horizon. A cape was seen in the north of this land, which formed the extremity of an east-and-west chain, though how far it ran to the east we could not see, nor could we be sure that it did not terminate in a great mountainous mass which rose beyond it, and of which the chain might only be a branch. In fact, two or three other lines of mountains seemed to run parallel to each other, unless, indeed, these lines are only those of important valleys; anyhow, there is a great mass of high land in the south-east. Towards the south the mountains seem to become lower and of more gentle outline. It is worthy of notice that here also a plain of ice of gentle slope lies at the base of the mountains, the glaciers merging into it from above, the plain itself merging into the sea-ice studded with imprisoned icebergs. In Alexander Land the glaciers thus fail to reach the sea, for they coalesce together into one great ice-foot, the existence of which fully explains the numerous tabular bergs which we encountered during the last two days. The great difference in the configuration of Alexander Land and the land we had seen further north may very probably be accounted for by the fact that Alexander Land lies outside the region of subsidence. Alexander Land has a wider basis than the Palmer archipelago or the northern part of Graham Land; it possesses a continuous coast-line in place of mountains, plunging perpendicularly into the sea. The continuous coast-line seen from a distance may indeed be broken into bays and capes in detail, but, even if so, all these irregularities are buried under the uniform plain of the ice-foot. But, on the other hand, we do not know what the scenery of the lands discovered by the *Belgica* would be like if they were restored to their aspect of the glacial epoch under a burden of ice as heavy as that which bears upon the remote antarctic solitudes of Alexander Land.*

* There is a very noticeable difference between my description of Alexander Land and that given by Dr. Cook in his work, 'Through the First Antarctic Night.' I cannot discuss the question from memory, and the only thing that I can say is that all my notes were written on the spot from day to day; that I have always made a point of

DR. SVEN HEDIN'S EXPLORATIONS, 1899–1900.

LETTERS lately received at the Society from the Swedish traveller permit us to give a more connected account than has yet appeared in the *Journal* of the important explorations carried out by him during the past eighteen months. Dr. Hedin continues his work with untiring energy, and we may safely say that so rich a harvest of scientific results has rarely fallen to the lot of any traveller. All has been done with characteristic thoroughness, and on the eventual publication of the maps and observations we shall possess a detailed knowledge of the regions traversed, such as is available for few countries beyond the limits of Europe and other of the best-known parts of the world.

Dr. Hedin's survey of the Yarkand-darya, or Tarim, is described in a letter written on February 25, 1900, but, through an oversight, not despatched until some months later. After making up his caravan at Kashgar, the traveller started in September, 1899, making his way direct to Lailik, on the Yarkand river, where he bought one of the large ferry-boats used for the transport of caravans across the stream. This he fitted up with every comfort, laying down a deck on which his tent could be pitched, with a dark cabin for photographic operations. Seated at a table at his tent door, he was able to map every turn of the river, sketching in its features with an amount of detail hardly available for any other river outside Europe. Floating slowly down with the current, the journey took three months, but its end was reached at Yangi-kul * before the closing of navigation by ice. Distances were fixed by the use of a special instrument giving the rapidity of the stream, which was measured many times each day. The volume of the river—which was measured some sixty times in all—was sufficient to float the boat throughout, except at a point where most of the water is diverted to supply the irrigation channels of Maral-bashi. The shallows here were passed with the help of one hundred men, who carried the boat over. At places the river has changed its course, and now flows through absolute desert, but these spots were very picturesque. Its course is exceedingly tortuous, some of the bends actually taking it in a westerly direction. Dr. Hedin made various excursions for the purpose of

---

giving correct descriptions and noting down exactly my first impressions. Cook says in his book that Alexander Land forms a group of islands, the largest of which is about 18 miles long, and that the mountains of this island attain a height of at least 4500 feet, etc. . . . It is always very agreeable to be able to furnish measurements, but when these measurements are simply based on estimate they do harm. It may be that the length of coast-line visible towards the south was 36 miles, and it is not improbable that the summits of Alexander Land reach a height of 9000 feet, or even more. The fact is that we made no measurements, and that we have little to add to the description as given by Bellingshausen.

* Placed in 87° 27′ E. in the Society's map of Tibet and surrounding regions.

visiting important places on either side of the river. His map fills sixty large sheets, while voluminous notes, photographs, etc., were also taken.

At Yangi-kul the explorer was joined by his caravan, which had come by the high-road *viâ* Aksu and Kurla, and here he formed his winter camp. For himself, however, there was to be no long rest, for in ten days he started with four men and seven camels for Cherchen, striking by a direct line across the desert. This was a difficult and dangerous journey, all supplies, and even fuel, having to be taken with the party. For twenty days nothing but sand was seen, but all went well, only one camel being lost *en route*. From Cherchen Dr. Hedin made an excursion to Andere,* and returned to Yangi-kul by the old river-beds of the Cherchen-darya, and new arms of the Tarim, after an absence of sixty-six days. This was in February, 1900.

Dr. Hedin's next work was in the Lob Nor region, where, as already announced in the *Journal* (vol. xvi. p. 345), very important discoveries were made, which, in the traveller's opinion, fully confirm his former views as to the history of the lake. A note in the December number of *Petermanns Mitteilungen* (p. 297) supplements in some particulars Dr. Hedin's first communication on the subject. Following the southern † foot of the Kuruk-tag and the dried-up bed of the Kumdarya, or "river of the desert" (see map in *Journal*, vol. xi. p. 692), the traveller reached (March 27) the shores of an old lake with extensive salt-deposits, as well as dead trees and sedge (kamish). The floor of the lake, which, in Dr. Hedin's view, can be nothing else than the ancient Lob Nor, consisted of horizontally bedded clay, with vast numbers of snail-shells, *Limnæa*, etc. The ruins discovered in the neighbourhood seemed to be those of a Buddhist temple and Chinese inn. During the march southward ruins of another, larger, settlement were discovered, and soon afterwards an expanse of water was reached, which proved to be the Kara-koshun, or Lob Nor of Prjevalsky. This has lately extended itself in a northerly direction, while shrinking in its southern parts, thus showing a tendency to return, according to Dr. Hedin's theory, to its ancient bed. A new arm of the Tarim, diverging at Shirge-chapgan and flowing east into the lakes first discovered by Dr. Hedin, was also found. Returning once more to Yangi-kul, the traveller sent his caravan south to the mountains, while he himself continued, in his boat, the exploration of the Tarim, and especially of the lakes fed by it to the west, finally reaching Abdal, near the entrance of the river into Prjevalsky's Lob Nor.

Dr. Hedin's latest letter, dated from Temirlik, in the Chimen (Chamen)

* Some 120 miles to the west-south-west of Cherchen, according to the Society's map of Tibet.

† In *Petermanns Mitteilungen* this appears as "northern," which is evidently a mistake. It is given as above in the letter received at the Society.

Tag, October 29, 1900, gives a brief account of a tour made during the summer of last year in Northern Tibet. Fixing his main camp a little south of Lake Gas, in a splendid mountain region called Mandarlik, he went south (July 20) with a caravan of 6 men, 7 camels, 12 horses, 1 mule, and 16 sheep. The route led south-east across the Akka Tag and back to the Chimen Tag by a circuit to the west, the total distance traversed being 965 miles.* As elsewhere, detailed observations of every kind were carried out, the map (from Abdal) being constructed in 194 sheets, and 16 positions fixed astronomically, bringing up the total number so fixed during the journey to 61. According to a letter sent by the explorer to a friend in Copenhagen, the furthest point reached to the south-east was in the neighbourhood of the upper Yang-tse. During eighty-four days not a human being was met with, though an old inscription on a rock proved that Mongols had once lived there. Wild animals, especially antelopes, bears, wild sheep, and goats, were numerous. The journey was concluded on October 20, one man (an Afghan hunter) and many of the animals having died on the way. Great cold was experienced—the thermometer falling on one occasion to −8° Fahr.—and much suffering was caused by storms from the west, always accompanied by snow and hail.

At the time of writing, Dr. Hedin was planning a short journey among the mountains to the west, after which he hoped, while the lakes and rivers were frozen, to complete his work in the district of Kara-koshun and the old lake-bed to the north.

JOURNEYS IN MESOPOTAMIA.—REVIEW.†

By General Sir CHARLES W. WILSON, K.C.B., K.C.M.G.

Dr. von Oppenheim has lived much in Moslem countries, has spent several months in the Arab quarter of Cairo studying Arabic, and Moslem customs and habits of thought, and has several times visited Syria and Palestine. The knowledge thus acquired was of great service to him during the journey which he undertook, in the summer of 1893, from Beirút through the Haurán, the Syrian desert, and Mesopotamia to Baghdád and the Persian gulf. It also gives a special interest to much that he has written. Historical notices of important towns, and frequent references to ancient and modern authorities, especially to

* Dr. Hedin says that the way led through completely unknown districts. This of course refers to the actual routes followed, for the region had been previously crossed in certain directions by Carey, Rockhill, Wellby, and Bonvalot.

† 'Vom Mittelmeer zum Persischen Golf.' By Dr. Max Freiherr von Oppenheim. 2 vols. Reimer. Berlin, 1899.

Arab historians and geographers, add much to the value of a pleasantly written record of the journey, which is accompanied by numerous illustrations, most of them good and some excellent. Great care was taken to obtain the correct forms of Arab place- and personal names, and in the text they are given in Arabic, with a transliteration in accordance with rules approved by the German Oriental Society. All names, whether in the text or on the maps, have been edited by two such competent authorities as Dr. Moritz and Dr. Hartmann. A marked feature of the book is the attention paid to the manners and customs of the races and tribes in the various districts passed through, and to their relations with the Imperial and Local Governments. A clear and connected account is published, for the first time, of the constant disturbances in the Haurán, from 1879, when Midhat Pasha made his well-intentioned attempt to introduce a modified form of Home Rule amongst the Druses, to the pacification of the country in 1897 by the vigorous action of Abdullah Pasha. Two chapters of much interest are devoted to the Bedawín, and more especially to the important section of the Shammar tribe which follows Sheikh Fáris, who some years ago submitted to the Turkish Government and accepted the rank of Pasha. During the last twenty years the Porte has brought steady pressure to bear on the nomads of Syria and Mesopotamia, by planting Circassian colonies amongst them, by increasing the number of military posts, by establishing a school at Constantinople for the sons and relations of the leading sheikhs, and sometimes by forcible settlement. The results thus far are encouraging. Waste lands are being brought under cultivation, the tribes are more under control, and there is greater security to life and property. The difficulties with which the Government has had to contend are well illustrated by the story of the long struggle of the Circassian colonists at Rás el-'Ain with the Shammar Arabs.

From a geographical point of view the value of Dr. von Oppenheim's book lies in the descriptions of new or rarely travelled routes, in the nomenclature, and beyond all in the valuable map and memoir prepared by Dr. R. Kiepert. Leaving Damascus, the author rode by Bosra and the eastern side of Jebel ed-Drúz to Sáli, and thence across the rock-sea of the Harra to Dumeir by a route, partly new, which enabled him to examine the volcanic district of Tulúl es-Safá, the interesting ruins of Kasr el-Abyad in the Ruhbe oasis, and the almost circular crater of Jebel Seis. Evidence of the former existence of a large population was found in the Tulúl es-Safá, and at the foot of Jebel Seis, where are the ruins of a town which it is suggested may have been the Roman station Anatha. From Dumeir to Bír Zobeide, and over the hills to Karietein, on the Damascus—Palmyra road, an untravelled route was followed, and the accurate nomenclature of the hill-country obtained for the first time. Passing through Palmyra, Dr. von Oppenheim reached Deir

ez-Zor, on the Euphrates, a town which, from its situation between the Anezeh and Shammar tribes, has played an important part in the policy of the Porte towards the Arabs.

From Deir a route, for the most part new, was followed up the valleys of the Khábúr and Jaghjagh to Nisibin, and thence to Háúr Zummar on the Tigris, and Mosul. The valley of the Khábúr is now waste. The few trees seen by Layard have disappeared, and it is difficult to find either fuel or camel fodder. From its junction with the Jaghjagh to the Euphrates, the river, even in summer, is full of water and can be forded only in a few places, and it is apparently navigable for small steamers above Sawar. The enormous number of mounds in the valleys of the two rivers, which mark the sites of towns, villages, and forts, and the remains of irrigation canals, attest the former prosperity of the country where, as late as the tenth century, olives and cotton were largely cultivated. An interesting instance of the wide-spread ruin caused by the passage of Turkish, Mongol, and Tatar nomads is the complete disappearance of the names of places mentioned by the old Arab geographers on the road from Nisibin to Mosul. From the latter place Dr. von Oppenheim rafted down the Tigris to Baghdád, and thence proceeded by river and ocean steamer to Basra, the Persian gulf, Maskat, Karachi, Bombay and Zanzibar. There was little new to describe, but the historical notes, especially those relating to the last thirty years, are valuable, and the narrative is well illustrated from photographs.

The book closes with a paper on the summer flora of Syria and Mesopotamia, which gives the Arab names of the plants collected, and notes by Prof. Dr. P. Ascherson; and a memoir by Dr. R. Kiepert to accompany the map of Syria and Mesopotamia in two sheets, on a scale of 1 : 850,000. The map has a special interest and value. In it Dr. Kiepert has embodied all the information collected by his father during his long, laborious life, and it is a fitting tribute to the memory of that eminent geographer. It is the first attempt to combine all existing material and produce a really detailed map of the two countries. A special feature is the care bestowed upon the nomenclature, and the successful effort, made with the collaboration of Profs. Moritz and Hartmann, to grapple with the diverse forms of place-names given by travellers of different nationality, and often ignorant of Arabic. Much attention has also been paid to the altitudes, which in many places are very uncertain from lack of accurate observations. The memoir, in which the data for the construction of the map are fully discussed, shows the care and thoroughness with which Dr. Kiepert has worked, and his map, well turned out by the firm of Dietrich Reimer, will probably long hold its place as the best of the country it represents.

Dr. Sachau's little book * is a record of a preliminary journey of

* 'Am Euphrat und Tigris.' By Eduard Sachau. Leipzig, 1900.

inquiry to Babylonia and Assyria, undertaken in the winter of 1897–98 at the instance of the Commission for the archæological exploration of the Euphrates and Tigris regions. The journey occupied six months, and led to the selection, as the first site for excavation, of el-Kasr (Babylon), where important discoveries have already been made. Dr. Sachau, who travelled extensively in Syria and Mesopotamia in 1879–80, and published the results he obtained in 1883, reached Babylonia on this occasion by way of the Red Sea, Persian Gulf, and Baghdád. After examining Babylon and the numerous ancient sites between the Lower Euphrates and the Tigris, he travelled up the right bank of the latter river to Mosul, and thence, after visiting Nineveh and other sites east of the Tigris, reached the Mediterranean by Deir ez-Zor and Aleppo. The book is charmingly written, concise without being dull, full of information on a variety of subjects, and enlivened by graphic pictures of life amongst the Arabs and other natives. The author, besides being a scholar and archæologist, is a close and keen observer, and his remarks on the geography and topography of the country, the great extension of cultivation since his previous visit, the acquisition of large landed estates by the Sultan, the advantages and disadvantages attending the employment of Kúrd and Arab irregular cavalry, and other matters, are much to the point. The narrative is illustrated by well-selected views from photographs by Dr. Koldewey and Herr Meyer of the Babylon Commission, and is accompanied by five sketch-maps of the route followed.

THE MONTHLY RECORD.

EUROPE.

A Rain-storm in Central England.—The January number of *Symons's Meteorological Magazine*, which will henceforth be edited by Dr. H. R. Mill, contains an interesting account of the heavy rains which fell over Central and South-Western England on December 30 and 31. Great damage was caused by floods in the valleys of the lower Severn and the Warwickshire and Somerset Avons. The great mass of data collected by the British Rainfall Organization has made it possible to publish a general description of the distribution of the heavy falls accompanying this storm within a fortnight of its occurrence. It appears that over 3 inches of rain fell in the twenty-four hours between 9 a.m. on December 30 and 9 a.m. on December 31 along a narrow belt of country stretching from Bristol and Chepstow to Coventry along the nearly straight line formed by the valleys of the lower Severn and the Warwickshire Avon, over a length of 85 miles from south-west to north-east, and a breadth averaging only 12 miles. The area of very heavy rain was limited on the south-east by the steep slopes of the Oolitic escarpment, but it was surrounded by a triangular surface of diminishing rainfall, which had an area of over 7000 square miles with a fall greater than 2 inches in the

twenty-four hours. The south-eastern edge of this belt appears to have corresponded roughly with the line of the Chalk escarpment from Dorsetshire to Berkshire, and then to have run in a more northerly direction nearly to the mouth of the Humber. The northern edge of the rainy area did not seem to have crossed the Trent. While no opinion is given as to the cause of this somewhat remarkable concentration of heavy rain, the fact is mentioned that just before the worst of the rain the wind had changed suddenly from south-west to north-east, in consequence of the passage in a south-easterly direction of a deep atmospheric depression. This suggests the idea—which it might be worth while to test—that the wind blowing along the steep face of the Oolitic cuesta, to use Prof. Davis's term, was unable to escape rapidly by lateral expansion over the surface of the ground, and so was checked sufficiently to allow of a much heavier precipitation in the deepest part of the valley than on the surrounding higher ground. In any case, the coincidence of the axis of such a phenomenon with the main structural lines of England can scarcely be accidental, and the relationship between configuration and meteorological occurrences is an interesting study in physical geography.

The Glaciation of the Inn Valley.—The problem of the terraces of the Inn valley, propounded by Prof. Penck twenty years ago, and to the solution of which he himself, with Blaas and Fritz von Kerner, afterwards contributed not a little, has been once more approached, with a view to its final settlement, by the professor in his latest researches. In brief outline, the results are as follows: The position and form of the Ziller glacier-tongue—important as the lowest member of a continuous stream of ice which in post-glacial times filled the whole floor of the wide Inn valley—was accurately determined. The existence of such a glacier, having its origin in the Zillerthal, had been already assumed as the only possible explanation of an impounding of the ice, to which in turn it was alone permissible to attribute the formation and peculiar form of the Inn valley terrace, as well as the high level to which the Achensee above Jenbach has been dammed back. In other words, the terrace of the Inn valley can only be put down, in view of the arrangement of its materials, as the lateral moraine of a glacier. From the mouth of the Zillerthal to the district above Kufstein, the valley presents all the characters of ground from which a glacier-snout has retreated. Below Jenbach there are found in succession down the valley, first the hollowed-out basin with the typical lake represented by the small but comparatively deep (34·5 feet) Rainthalersee; next a stretch with a drumlin character, from Kundl to Angath; and finally the end-moraines of Kirchbichl. Owing to the absence of striæ, it was necessary to have recourse to the American view of "kames," or shingle-moraines, to explain the genetic character of these surface forms. After the last glaciation of the great ice age—the fourth according to the results of recent investigations—during which the snout of the Inn glacier filled the basin of Rosenheim on the northern skirts of the Alps, the ice retreated to Imst, north-west of the mouth of the Oetzthal, or more than 60 miles above the position of the Kirchbichl snout, and a corresponding distance in the side valleys. These two positions of the snout correspond to the "Wippstadium" and "Innstadium" of Penck. Now, since the three important side valleys of the Oetzthal, Wippthal, and Zillerthal enter the main valley during this interval, a comparatively small advance of 20 miles or so from each of these was sufficient, at the time of the main advance which followed the retreat above mentioned, to fill with ice the whole 60-mile section of the main valley. From his own investigation of the moraines, supplemented by those of Fritz von Kerner, Penck defines three stages of glaciation subsequent to the ice-age. The fourth and last glaciation properly belonging to this, in which the snow-line descended to 4000 feet, was followed by the "Wippstadium" above mentioned, when the snow-level

rose to 6300 feet, and this again by the "Innstadium," which was marked by the most extensive glaciation since the ice-age—that to which the terminal moraines at Kirchbichl belong. The snow-line then descended again to 5000 feet. Next came the "Gschnitzstadium," with a snow-line at 6600 feet, followed by the stage at which the glaciation of the Alps now remains, with a snow-line at 8200 feet on the edge, and 8900 feet in the centre, of the range. The post-glacial epoch, which, apart from a hypothetical advance of the ice supposed by botanists, has been regarded as a single unit, has now, therefore, been shown to consist of a series of stages.

ASIA.

Scientific Results of Dr. Hedin's Journeys.—By the publication, as a supplementary number (131) of *Petermanns Mitteilungen* (forming at the same time a complete volume in itself), of the scientific results of Dr. Hedin's journeys in Central Asia between 1894 and 1897, a mass of detailed information on the geography of the inner regions of the continent has been presented to the world, such as has rarely, if ever, been brought home by a single traveller since the time of Humboldt. Dr. Hedin's geographical genius, and the ardour with which he has thrown himself into the tasks he has undertaken, are well known, but only a perusal of his minute and exhaustive descriptions of the countries visited permits us to realize to the full the untiring zeal and industry brought by him to the execution of his work. It is unnecessary to recall here the broad results of Dr. Hedin's journeys, which are already so well known to geographers, and, amid the mass of material now made available, it would be difficult to select any as specially calling for mention. The bulk of the work is made up by a series of chapters in which the whole itineraries followed through Turkestan, Northern Tibet, and the region of the upper Hwang-ho are presented to the reader, with a detailed commentary on the physical structure of the country, its surface features, and the changes these have undergone, as well as on the natural processes by which such changes have been brought about. The description is illustrated by a large number of sketches, sections, and diagrams, by which an understanding of the various physical phenomena is much facilitated. Among the many interesting points discussed are the formation and structure of the dunes, and of the peculiar conical hills held together by the growth of tamarisks; the movements of underground water, in which connection the remarkable fact is recorded, that in the immediate neighbourhood of the larger streams the well-water is brackish, but in the centre of the desert is perfectly sweet; the growth of vegetation in lagoons and on the margins of streams, and many others. The question of the past history of Lob Nor is of course entered into, while a series of appendices treat of the altitudes, nomenclature, botany, and other special subjects. Special mention must be made of the admirable maps prepared by Dr. B. Hassenstein, which not only give the results of Dr. Hedin's surveys, but combine in a way never before done the whole of our knowledge of the Tarim basin and Northern Tibet. There are five sheets on the scale of 1 : 1,000,000, three showing the Tarim basin and the mountain ranges to the south, the other two the central and eastern sections of the great Kwen-lun system. A particularly valuable feature is the facility given for the correlation of the work of different travellers, which has so often been published without any attempt at combination. Thus the parallel routes of Captain Wellby and Sven Hedin, the relative position of which has never been quite clear, are well brought out. Strangely enough, the journeys were made at an interval of only a month, but the routes, though in places only 20 miles apart, were separated by the high range of the Koko-shili. The results of Captain Wellby's journey are

better shown by Dr. Hassenstein than ever before,* and a connected view is likewise presented of the surveys of MM. de Rhins and Grenard, of which the excellent sectional maps of the latter fail to give a good general view. The importance of a further exploration of the Arka (Akka) Tag, which Dr. Hedin regards as the main range of the Kwen-lun system, and to which he has lately returned, is well brought out by the wide blank which occupies its position on the map, though its extensive snow-fields were seen by the traveller as he skirted it in 1896.

Russia and Manchuria.—The agreement concluded between Russia and China at the close of last year concerns only Feng-tien or Sheng-king (formerly Liao-tung), the southern of the three provinces into which Manchuria has recently been divided under Chinese administration, but this is the most thickly peopled and important, while similar arrangements may be expected to be made before long for the other provinces. According to the terms of the agreement, the civil administration of Feng-tien is allowed to remain in the hands of the Chinese, while the military occupation is maintained by Russian troops, and a Russian political resident with general powers of control will be stationed at Mukden, the capital of the province. The Chinese soldiery is to be disbanded, and all forts and defences not occupied by the Russians to be dismantled, the munitions of war contained in them being handed over to the latter. Law and order will be maintained by local police under the Tartan general Tseng, who will, however, apply for Russian help in case of emergency. Niu-chwang and other places now occupied by Russia will, however, be handed over to the Chinese civil administration when the pacification of the province shall have been deemed complete. The area of the province is estimated at 55,000 square miles, and its population at about 5½ millions, while the two other provinces, Ghirin and Helung-kiang, have an area of about 100,000, and 200,000 square miles respectively, with populations estimated at 6 millions and 1½ millions. By reason of its fertility and natural productions, no less than as affording the future highway between Eastern Siberia and Northern China, Manchuria possesses great importance, and the effects of the recent agreement are likely to be far-reaching. Information on the country is to be found in Mr. H. E. M. James's paper published in the *R.G.S. Proceedings* for September, 1887, as well as in his book, 'The Long White Mountain'; in Captain Younghusband's book, 'The Heart of a Continent'; and in the paper by Mr. Turley published in the *Journal* for September, 1899.

The Salt Lake of Larnaca, Cyprus.—In a paper recently read before the Geological Society, Mr. C. V. Bellamy gave a description of the salt lake of Larnaca, in the island of Cyprus. His investigations were conducted mainly with the object of settling the question as to the origin of the salt in the lake, which is situated about a mile or more to the south-west of the town of Larnaca, and occupies a hollow on the eastern side of an irregularly shaped basin, its deepest part being about 10 feet below mean sea-level. The barrier between the salt lake and the sea is mainly composed of shelly sand overlying a bed of stiff calcareous clay associated with masses of conglomerate. Between the lake and the sea the ground is so salt as to preclude cultivation, but on the other sides the soil is of average fertility. The sea-water appears to percolate through the uppermost deposits, and, meeting with checks in the conglomerates, slowly reaches the basin, where it is evaporated to dryness by the summer heat and deposits its

* An error is, however, made in showing the Chumar river as rising in the lake to the west, unless the fact of the freshness of its waters be considered proof of an outlet. Captain Wellby stated in his book that the Chumar rises in the hills to the east of the lake.

salt. Artificial channels have been made to intercept flood-water and convey it to the sea, so that it does not dilute the brine of the lake. The rainfall in the catchment-area of the lake is shown to be only 223 million gallons, and as the capacity of the lake is 480 million gallons, it is assumed that the balance of 257 million gallons must be derived from the sea. The lake is probably situated on what was an extensive arm of the sea at the close of the Kainozoic Age. The salt-harvest commences in August at the zenith of summer heat, and it is reported that the occurrence of one heavy shower at this time of year suffices to ruin its prospects. The quality of the salt collected in the Larnaca salines is said to be of unusual excellence, and it is suggested that a large and remunerative traffic could be carried on if markets could be opened for the salt. The paper is illustrated by a number of maps.

Dr. Schaffer's Journey in Asia Minor.—Further news of Dr. Schaffer's geological researches in Asia Minor (cf. *Journal*, vol. xvi. p. 556) is given in the December number of *Petermanns Mitteilungen* (p. 297). From Adana the traveller crossed the plain to Cape Karatash, afterwards ascending the Dede-Dagh, and visiting Jebel Missis and other ridges composed of reef-like rocks with vertical strata and a general strike from north to south. He then made his way to Rudrum Kale, crossed the Jihan at Kum Kale, and proceeded to Kushju. This lies west of Mount Duldul, which an attack of fever prevented the traveller from climbing. It has two steep summits, which the natives consider inaccessible. The high water-level in the Jihan necessitated a circuit to the east round Mount Duldul in order to reach Maraul, whence Dr. Schaffer made his way between the Giaur Dagh and the Kurd Dagh to Antiochia, and on *viâ* the Beilan pass to Alexandretta. He says that there is a distinct continuation of the Syrian depression in the form of a rift-valley, which in the neighbourhood of Marash is intersected by the lines of dislocation of the Taurus.

AFRICA.

Baron Erlanger's Expedition to Abyssinia.—News has lately been received of the arrival at Addis Abbaba, after a successful journey through the country of the Arussi Gallas, of the Erlanger expedition, which set out in January, 1900, for the purpose of scientific exploration in North-East Africa. The primary object of the expedition was the study of the distribution of animals in this part of Africa, the superintendence of the zoological collections being shared by the leader with Herr Oscar Neumann, known for his former journeys in East Africa. Geographical work was not, however, excluded from the programme, and a cartographer, Herr Johann Holtermüller, was attached to the expedition for this object. Dr. Ellenbeck, the doctor of the expedition, hoped also to secure collections of botanical specimens. The explorers, who started from Zeila on January 12, 1900, reached Harrar early in March, excursions having been made in various directions off the direct route. From Harrar, a south-westerly route through the almost unknown country of the Arussi Gallas was chosen, with a view to striking Dr. Donaldson Smith's route at Skeikh Husein. Details of the journey are not yet to hand, but it is stated that the country traversed was picturesque and fertile, and inhabited in part by agriculturists of Arab race.

Further Explorations in the Siwa Oasis.—We learn from the December number of the *Geographische Zeitschrift* that the exploration of the Siwa oasis, towards which Mr. Silva White and Baron von Grunau have each contributed something within the last few years, has been continued by an expedition under Prof. Steindorff, in which Baron von Grunau again took part. Its primary object was the examination of the remains of temples and tombs which the former

expeditions had shown to exist in such numbers in the oasis of Jupiter Ammon, but attention was paid to other researches also. A start was made in November, 1899, and the Siwa oases reached after a march of nineteen days. The attitude of the Senussi sheikhs to the party was reserved, but not openly hostile, and the antiquarian research yielded rich results. On the return journey rock tombs were discovered in the Araj oasis, pointing to a larger population in former times. Excavations in the Bahrieh oasis also brought to light two Egyptian temples of the sixth century B.C.

The Uganda Protectorate.—The preliminary report by her Majesty's special commissioner on the Uganda Protectorate is of value, as giving the general conclusions as to the prospects and capabilities of that country by one of such wide experience in tropical Africa as Sir Harry Johnston. The maps by which it is accompanied are likewise useful as attempts to show, in a graphic form, some of the chief factors to be taken into account in the problem of the future of Uganda. In the first, the protectorate is divided up into zones of altitude, this being, in Sir H. Johnston's opinion, the determinant factor as regards the healthiness or unhealthiness of the separate districts. The large areas above 5500 feet are almost entirely free from malarial fever, and are said to be as healthy for Europeans as the best parts of North and South Africa, although even here health must depend on the use of dwellings with sound roofs, and windows that can shut out the cold winds. Between 5500 and 3500 feet the country is only moderately, but below 3500 feet must be regarded as very, unhealthy. This is especially the case along the banks of the Nile (except at the station of Wadelai), the coasts of Lake Albert, the district of Lake Baringo, and in a less degree the shores of Lake Victoria. Much of the present ill health might, however, be got rid of by draining the swamps and clearing away the rank vegetation which shelters mosquitoes, as also by the building of better houses. The second map shows the rainfall, which, in the districts north, east, and west of Lake Victoria, is estimated at 40 to 60 inches annually, decreasing towards the north and north-east, until on the southern half of Lake Rudolf it is probably less than 10. The wettest districts of all are those round the slopes of Ruwenzori and Elgon, but the Mau plateau has also a large rainfall. In the greater part of the country a dry season scarcely exists, though the greatest rain follows the equinoxes. The population map shows the most densely peopled areas to lie round Mount Elgon, and along the western and northern shores of the Victoria Lake, where the number to the square mile is put down as from sixty to one hundred, and in certain small districts above one hundred. Among the Bantu-speaking peoples, Sir H. Johnston considers that an extraordinary improvement—mainly due to missionary work—has taken place since the barbarous days of Mtesa and Mwanga. The naked Nilotic negroes, on the contrary, give no encouragement to missionary work. The question of the products and resources of the protectorate is fully entered into. About two-thirds of the area has a singularly fertile soil, but the useless life led by the natives—fostered by the abundance of the banana—has caused this natural wealth to remain undeveloped. Wheat, oats, and barley, thrive on the uplands and drier districts to the north, and almost any other grain in the lowlands. Rice has been until lately almost neglected, but the numerous swampy valleys are admirably suited for its cultivation. With railway and steam transport, no other part of tropical Africa could compete with Uganda as a coffee-growing country, while parts are singularly suited for the cultivation of cacao and tea, for the latter of which a native demand may be expected. Sugar has already been manufactured for local use. Other important resources are rubber and timber, while with suitable regulation the ivory supply might be made a permanent asset. Little can be said as to the existence of

minerals, but in addition to iron, copper, gold, and coal have been reported. In discussing the present position, Sir H. Johnston attributes much of the civilized aspect of Uganda to the enlightened ideas of the native chiefs. As an instance of the progress of education, he mentions that several of the chiefs use typewriters. He regrets that the Baganda have not been taught English by the missionaries, Ki-Swahili being not nearly so useful as a *lingua franca* here as in other parts of East Africa.

Prof. Fischer's New Expedition to Marocco.—It is announced in *Petermanns Mitteilungen* that Prof. Theobald Fischer, of Marburg, whose researches during 1899 on the physical geography of the country along the northern foot of the Atlas were referred to in the *Journal* for that year (xiii. p. 660, xiv. p. 209), has undertaken a third journey to Marocco, during which he will devote his attention to the "black earth" region which extends from Mogador in the south to Larash in the north.

AMERICA.

Explorations in Labrador.—A recent number of *Science* (1900, November 2) records the results of soundings carried out last summer by the schooner *Brave* on the Labrador coast. These have shown that the deepest of the fjords, so characteristic of that coast, is not Hamilton inlet (54° N.), as has been previously supposed, but that greater depths occur in Nachvak bay in 59° N. This fjord, which extends some 25 miles into the land, with a U-shaped section and precipitous walls, is cut off from the open sea by a rocky sill, immediately within which the water has a depth of 107 fathoms, while 6 miles to the west it reaches 110. Two other sills divide the deep water of the fjord into several basins. The bottom temperature (at 110 fathoms) was 29° Fahr. in August. Explorations in the interior were carried out last summer (according to a note in the December number of the *Geographische Zeitschrift*) by a party from Harvard University,* which spent three months in these northern regions. The country explored was everywhere mountainous, and three high summits, named respectively Mount Eliot, Mount Faunce, and Mount Elizabeth, were discovered. Gold and other valuable minerals were also found.

Travels in Mexico and Guatemala.†—Those who undertake to go over the beaten paths in countries so long known to the civilized world as those of Central America, do so, not in search of the new, but rather in the hope of revealing the old. Such, we are expressly told, was the main object of the distinguished Berlin archæologist, Prof. Eduard Seler, who, in 1887–88 and 1895–97, paid two long visits to these lands in the interest of archæology and ethnography. On both occasions he was accompanied by his wife, Frau Cæcilie Seler, who, however, confines herself in this volume to an account of the second and more important journey. No pretension is made to scientific treatment, and the contents are modestly declared to be nothing but a reproduction of the writer's experiences and impressions. But it will be found that some of these experiences are of exceptional interest, while the impressions acquire permanent geographic value from reproductions of an almost unique series of photographs, mostly taken, often under trying conditions, by the gifted lady herself. In some respects Frau Seler's work

* Presumably the same by which the above-mentioned soundings were carried out, as the note in *Science* is communicated by one of its members, Dr. R. A. Daly.

† 'Auf alten Wegen in Mexico und Guatemala. Reiseerinnerungen und Eindrücke aus den Jahren 1895–97.' Von Cæcilie Seler. *Map and Illustrations.* Berlin, 1900.

forms a close parallel with the sumptuous volume issued in 1899 by Mr. and Mrs. Maudslay, who, in Chiapas, Guatemala, and Honduras, had traversed much the same ground a little in advance of the German travellers. On reaching Quirigua, by way of Puebla, Oaxaca, and the Tehuantepec peninsula, in January, 1897, Dr. Seler found that some of the elaborately sculptured monoliths, which had been cleared for the impressions taken in 1894 by Mr. Maudslay, had in that short interval become again so thickly moss-grown that it was difficult to distinguish their outlines. In the presence of these stupendous blocks, the travellers were almost awestruck, wondering how such monuments, with their fanciful and intricate ornamentation, could have been erected by a people like the Mayas, who had no knowledge of iron. On visiting the monuments near the Honduras frontier, they again found that the clearings made in the forest by former travellers had been once more overgrown with dense bush. "For hours," writes Frau Seler, "we crept along in this tangled wilderness, wearily hewing a way with the woodman's knife. Luckily, my husband had brought Maudslay's plan, which enabled us to find the more important objects, . . . though a general view of the site is unfortunately prevented by the too luxuriant vegetation." In her preface, Frau Seler remarks that, so far as she is aware, nobody since the days of Thomas Gage, over two centuries ago, has given a consecutive account of the country along the historic highway from Oaxaca by Chiapas to Guatemala. Now the student will find this region not only graphically described, but admirably illustrated from the writer's negatives. The account of an expedition to the rugged uplands of Mixteca Alta (Mixtlan, "Cloudland," of the Aztecs), which may be said to have been rediscovered by our travellers, abounds in details of exceptional interest to the geographer, the naturalist, and the antiquary. New and old were here intermingled in delightful confusion. Stately Spanish churches, themselves in ruins through earthquakes and neglect, were found standing on the foundations of ancient Zapotec and Mixtec temples. The women, who could speak only the strange tongues of pre-Columbian times, were seen crouching in the very attitudes depicted in the Aztec picture-writings. Wheat, barley, and oats of recent introduction were found flourishing side by side with the native flora. The whole ground was strewn with relics of antiquity, while the exquisitely painted clay vases, resembling those of Cholula, discovered in old graves, gave a striking confirmation of Förstermann's view that the so-called "Toltec" builders of Cholula, Teotihuacan, etc., were not Nahuas or Aztecs, but Mayas, who at an unknown epoch migrated from the Anahuac plateau to Guatemala and Yucatan, leaving memorials of their presence in Mixteca Alta, Tehuantepec, Chiapas, and other districts. It should be mentioned that, besides antiquities and ethnography, much attention was everywhere paid to the local flora. But the rich botanical collections, not being yet completely classified, are reserved for publication elsewhere. The want of an index will be sorely felt by students, but some compensation will be found in the excellent large-scale map, which is a noble specimen of German cartographic art.

British Guiana Frontier Delimitation.—We have received from Lieut. Herbert Street, of the 20th Hussars, who, at the invitation of Captain Rolleston of H.M.S. *Surprise*, lately accompanied the boundary delimitation party to Point Playa, the starting-point of the new frontier on the coast, an account of the proceedings for the determination of the position of the point, and its marking by a permanent beacon. The Venezuelan Commissioners having failed to appear, the *Surprise*, with the British Commissioners, Captain A. W. Baker and Mr. M. McTurk, on board, sailed from Georgetown on October 5, 1900, arriving off the mouth of the Waini river the following day. The position of Point Playa was a matter of uncertainty, as the strip of coast in which it lies is rarely visited, being

quite uninhabited, and forming a vast mangrove swamp with occasional mud flats and small shingly beaches. The surf is dangerous at times, and on this account a surf-boat manned by an Indian crew had been brought. By means of the ship's cutter, a landing was effected at the mouth of the Waini, where was a very small shingle beach which had formerly stretched a mile out to sea. It had lately been visited by Indian fishermen. The search for the point proving ineffectual, it was resolved to proceed by the Mora passage, 7 miles long, connecting the Waini with the Barima, to Morawhanna, a small settlement visited once a week by a steamer from Georgetown. A Portuguese fisherman who lived here was the only man known to have visited Port Playa, and with his help, though still with some difficulty, the required spot was discovered. Its position was fixed astronomically as in lat. 8° 33′ 25″ N., long. 59° 59′ 45″ W., which differs materially from that hitherto shown. After a return to Georgetown, a second visit was paid to the spot for the purpose of erecting a beacon, much difficulty being again experienced from the violence of the surf. The beacon has a base of concrete 4 feet square sunk 3 feet into the ground, surmounted by blocks of 3½ and 2½ feet respectively, at the top being a pole with board stating the position as fixed, the names of the commissioners, and the date (October 9, 1900).

British Guiana.—Among other matters dealt with in the 'Reports for 1897–98 and 1898–99,' on British Guiana, the following may be noted. There are indications that the people of the colony are directing their attention to the cultivation of minor products and to industries other than sugar. Rice is being largely grown, and tobacco has been successfully cultivated. Between the true coast lands and the ranges of sand-dunes which occur in Berbice, Demerara, and Essequebo, there are large tracts of alluvial soil which appear to be suitable for the cultivation of various products. Gold-mining operations have been carried on during the years under notice, and the probable future prospects of this industry are said to be distinctly favourable. Geological surveys were made of the Potaro, Conawaruk, Omai, Demerara, and part of the Essequebo rivers, and the knowledge acquired points to the gold-bearing regions of these rivers being much more extensive than was formerly believed. Many facilities are offered by the new Crown Lands Regulations which came into force on May 1, 1898. It is thought that the natural wealth of the Crown forests must in time attract outside capital. Woods of great beauty and variety abound, suitable for various purposes; as also gums of recognized commercial value. The population of the colony on December 31, 1898, was estimated at 286,222, showing a decrease of 262 as compared with the preceding year. The mean temperature throughout the year 1898–99 was about 82° Fahr., the mean maximum being 88° in the month of September, and the mean minimum 74° in the month of January. There are two lines of railway in the colony—from Georgetown to Mahaica (county of Demerara): length open for traffic 20 miles; and from the Demerara river to the Essequebo river, 18¼ miles, metre gauge. The total length of roads open for traffic is given as 264 miles. There are three canals on the Demerara river, two on the left and one on the right bank, each 4 miles long and 60 feet wide, and running at right angles to the river.

Geography of the Rio Tapajos, Brazil.—In 1896 and 1897, journeys on the Tapajos for the purpose of geological research were undertaken by Dr. F. Katzer, who gives in *Globus* (vol. 78, No. 18) some interesting notes on that imperfectly known river and the settlements on its banks. The use of the river for steam navigation is confined to the lower section, below the first cataract—that known as Maranhãosinho—the construction of roads at the portions broken by rapids being indispensable for the proper utilization of the Tapajos as a line of

communication with the interior states of Brazil. The last settlement served by the regular steamers is Lauritania, on Ananaz island, 17 miles above Itaituba. This, though containing only 281 inhabitants, is the chief centre of a widely extended "municipio," which reaches the southern limits of the province of Para at the Salto Augusto. With the recent development of the rubber industry, new settlements have sprung up, while others that still figure on our maps have passed out of existence. Such is the old Munduruku settlement of Uxituba, founded by P. Egydio de Garezio, in 1848, as also those of Sipotuba and Bacabal. The settlements near the Tapajos mouth—Altar do Chao, Boim, and Aveiro—all show signs of decline, and though the last-named is still the largest village on the Tapajos proper, its place will soon be taken by Itaituba, where the construction of a steamer pier, public hall, and a fine church has already been taken in hand. Its commercial importance as the centre of a rich rubber district is already greater than that of Santarem. Three rubber-plantations—a great rarity on the Amazon—have been started here. Dr. Katzer gives details as to the breadth of the lower Tapajos at various points. At Bella Vista, near the falls, it is only 200 yards wide; at Itaituba, 3480 yards; to about which breadth it again narrows at Aveiro, though generally far wider between Itaituba and its mouth. The bottom of the river is extraordinarily uneven, in consequence of the unequal resistance offered by the geological formations which compose it. Reefs, with associated sandbanks, are formed by hard conglomerates, and often cause the greatest hindrances to navigation, many spots being impassable at low water. Narrow channels, with depths of from 50 to 70 feet, remain open, however, at many of these points. Between the lowest falls and Altar do Chao the greatest depth found was 77 feet (a little above Itaituba). The difference between high and low water level amounts to from 16 to 20 feet on the lower river, where the dry season lasts from July to December. Remarkable anomalies in the levels observed sometimes occur. Thus, while the highest level at Cury was in 1897 about 8·7 inches below that of the year before, at Itaituba it was registered as 0·66 inch higher than in 1896. The rate of flow varies immensely at different parts. Opposite Santarem it was found to be, on an average, 1·15 foot per second, but no current at all could be discerned between Altar do Chão and Boim. From sectional measurements of the bed of the river, Dr. Katzer found the volume at Santarem to be 438,900 cubic feet per second, but at Itaituba only 97,380. Although the measurements were not made simultaneously, Dr. Katzer thinks the difference cannot be wholly due to this, but that at Santarem the volume is swelled by water entering from the Amazon by Villafranca.

Austrian Explorations in Brazil.—In April next a scientific expedition is to be despatched by the Vienna Academy of Sciences to the states of São Paulo and Parana, in Southern Brazil, with the primary object of researches on the flora of the Serra do Mar and the Serra do Paranapiacaba—a district at present almost a *terra incognita* from this point of view. Geographical work will not, however, be left out of sight, while attention will be paid to meteorology and climatology, and to the collection of zoological and geological, as well as botanical specimens. The expedition will be abundantly equipped with all the necessary appliances. Its leader will be Dr. Richard von Wettstein, professor of botany and director of the botanical gardens in Vienna, and his staff will include Prof. V. Schiffner, of Prague, as second botanist; Dr. Fritz von Kerner, of the Vienna Geological Institute, as meteorologist, geographer, and artist, besides having medical charge of the party; and August Wiemann, of the Vienna Botanical Garden, as gardener. It is probable that representatives of other branches of science, as well as of the Brazilian State Survey, will also join the expedition, which will not return till

November, though at present no definite limit has been fixed to its duration. It is regarded as the first of a series of expeditions to be sent out by the Vienna Academy to the portion of Brazil above alluded to, for its all-round scientific study from the modern point of view. Others which may be sent in succeeding years will therefore take up different branches of science as their special object of research. In laying down this programme, the Academy is taking a course quite in keeping with old Austrian traditions. In the eighteenth century Brazil yielded to the zeal of Jacquin, who in after-years did much to give direction to the early training of Simony, the rich horticultural treasures which have made the reputation of the park at Schönbrunn. Early in the nineteenth century valuable contributions to our knowledge of Brazil were supplied by the Austrian naturalists Mikan, Pohl, Natterer, Schott, Tschudi, Lhotsky, Wawra, and others; while that most valuable monument of scientific research, the 'Flora Braziliensis,' first saw the light in 1829 under the auspices of the Austrian imperial house. The resumption of Austrian interest in Brazil, at the opening of the twentieth century, meets with the cordial support and approval both of the Central Brazilian Government and those of the states concerned.

AUSTRALASIA AND OCEANIC ISLANDS.

The Australian Commonwealth.—The scheme of federation, which has so long engaged the attention of the Australian Colonies, and to which effect was finally given by the Act passed by the British Parliament in July, 1900, took practical shape on January 1, 1901, when the new Commonwealth was formally inaugurated at Sydney by the swearing in of Lord Hopetown as first Governor-General. The colonies which have joined in the movement and together form the Commonwealth of Australia are those of the Australian continent, together with Tasmania, New Zealand having no doubt wisely decided against participation in view of the great expanse of ocean by which she is situated from the rest. West Australia, which at first held aloof, has since joined as an original State. The site of the Federal capital has not yet been decided on, but it will in any case be a town, other than the present capital, within the colony of New South Wales, a name mentioned in this connection being that of Orange, situated some 25 miles north-west of Bathurst. The following table shows the area and population of the separate colonies, and their trade and financial position as given in the Statesman's Year Book for 1900:—

	Area, sq. miles.	Population.	Debt.	Revenue.	Expenditure.	Total imports.	Total exports.
New South Wales ...	310,700	1,357,050	63,761,666	9,754,185	9,754,417	24,453,560	27,648,117
Queensland	668,497	498,523	33,598,414	4,174,086	4,024,170	6,007,266	10,856,127
South Australia ...	903,690*	362,897	24,431,590	2,665,477	2,632,840	6,184,805	6,795,774
Tasmania	26,385	146,667†	8,412,904	908,223	830,168	1,650,018	1,803,369
Victoria	87,884	1,176,854	48,354,277	6,887,463	6,692,444	16,768,184	15,872,246
Western Australia ...	975,920	168,480	10,488,363	2,604,943	2,880,495	5,241,965	4,960,006

It is to be hoped that a new era of prosperity awaits the colonies in their federated state, and that the new conditions will also be beneficial to the Empire at large.

Mitigation of Floods in the Brisbane River.—In a paper on this subject, contained in a recent issue of the *Queensland Geographical Journal*, the Hon.

* Including the northern territory.

† In 1891.

A. C. Gregory mainly deals with the scheme recommended by Colonel Pennycuick, whose name is connected with important works of this nature in India. His scheme, we learn, "is to form a regulating reservoir in the upper Brisbane valley, in which a sufficient quantity of water can be stored during the high floods to reduce the river 15 feet at the Victoria bridge, and thus restricting the flood level to 15 feet above mean tide, and this would reduce the surface gradient of the river one-half below the bridge." "For this purpose he proposes to construct a regulating reservoir, having a capacity of twenty-five thousand million cubic feet, in which to store the surplus rainfall until the excessive rain ceases." Colonel Pennycuick bases his computations on the records of the rainfall during the flood of February 5, 1893, and considers that the flow of water in the channel of the river would be limited to four-fifths of the rainfall, the remaining fifth being absorbed by the soil and vegetation within the catchment area. He is also of opinion that the river-channel, which is below tide-level, is of little use for the transmission of flood-water, and therefore dredging the river below the city will not afford relief from flood. By applying the data to the heavy rainfall and floods of 1893, the author endeavours to show that a regulating reservoir of such a capacity as that proposed by Colonel Pennycuick would be quite inadequate to retain the surplus waters of abnormal floods like that of 1893. He is of opinion that Colonel Pennycuick's scheme is a feasible one, but points out that the reservoir ought to have at least five times the capacity of that specified for the storage of the excessive rainfall. The system is one which would apparently entail a greater cost than the colony could afford to expend on a work which would only benefit a single district. A tabulated series of observations of rainfall during the flood of February, 1893, is given, the paper closing with a discussion on the subject.

Geology of the Bismarck Archipelago.—A short sketch of the geology of the Bismarck archipelago, given from personal observation by Dr. G. Thilenius, in *Globus* (vol. 78, No. 13), is of interest in view of the extremely scanty knowledge hitherto possessed respecting the geological structure of the islands. The rocks of the archipelago are almost entirely either coral or of eruptive origin. The eastern section, to the east of the main islands, consists without exception of atolls, the separate islets of which are merely heaps of *débris*, so that the natives lack all articles of stone, with the exception of axe-heads made of stones obtained from the roots of driftwood. The western section, into the structure of which Dr. Thilenius enters with greater detail, displays both coral and eruptive rock. In the Taui (Admiralty) group, which is the most important of this section, the principal rock is obsidian, which forms steep cones, but Dr. Thilenius found beneath this specimens of a micro-granite, while two kinds of ore (one a Pyrolusite) also occur. The group shows signs of great fluctuations in level. The Agomes group, west of Taui—a typical coral group, according to Darwin's theory—has in its centre islets formed by an old basalt eruption, which must originally have covered all the space enclosed within the present outer reef. The Ninigo group, shown on the maps as surrounded by one continuous reef, is in reality quite different, as many passages exist, including a wide and deep one dividing the group into two separate sections. As regards the central group of the archipelago, Dr. Thilenius considers that the central chain of New Britain is the continuation of the primitive rocks of the centre of New Guinea. The island seems originally to have been connected with the latter, ending eastward in the Baining range of the Gazelle peninsula, where the old coral reefs can still be seen; the rest of the peninsula being of more recent date. New Ireland must be regarded as an old fringing reef, once forming the eastern edge of a land now sunk beneath the sea, and which may have formed one mass with New Guinea and New Britain. The

writer points out the importance of the discovery of the micro-granite, with the associated Pyrolusite, on Taui, especially in its bearing on the possible existence of sedimentary formations on the northern, as on the southern, side of the primitive axis of the islands.

Expedition to Kerguelen Land.—We learn from the *Mouvement Géographique* that Captain de Gerlache, late commander of the Belgian Expedition to the antarctic, has undertaken a new voyage to Kerguelen Land on behalf of a French colonization company, the object of which is to attempt the acclimatization of sheep on the island. The expedition consists of a steam-yacht and a sailing ship, the latter of which will transport 1500 sheep, as well as some shepherds, from the Falkland islands to Kerguelen, the climate of the two being in many ways similar. The party will include two French zoologists, MM. Ronnier and Pérez, who will study the natural history of the island, where meteorological observations will also be made.

POLAR REGIONS.

Captain Bernier's Proposed Expedition.—We have received from Captain Bernier, whose proposed expedition towards the north pole was briefly alluded to in the last number of the *Journal*, some details regarding the plans put forward by him, as well as of the circumstances which have led him to the formation of the design. It may be premised that Captain Bernier has had a large experience in matters relating both to shipbuilding and ice-navigation, having been superintendent in a shipyard during eight winters, and served as ice-pilot on the coasts of Labrador and Newfoundland and in the St. Lawrence river, besides commanding many vessels and visiting the coasts of Greenland. He has for many years paid special attention to arctic voyages, and was in particular interested in the intended voyage of Gustave Lambert by Bering strait in 1867–68, and in that of Delong in the *Jeannette* in 1879–81. These, with the subsequent voyage of Dr. Nansen in the *Fram*, have been the means of turning his thoughts to the possibilities of a successful voyage northward by the Bering strait route, advantage being taken of the drift which carried the *Fram* across the polar basin. By making the start further eastward than the *Fram*, Captain Bernier hopes to pass over the position of the pole itself. He proposes to build a small ship of about 250 to 300 tons, possibly of steel, on the special lines used in the construction of the *Fram*, but with some improvements. The crew will consist of twelve carefully selected men, including the scientific staff, whose work will consist of dredging and sounding, determinations of temperature both of the water and air, the study of ice-formation, drift, *aurora borealis* and magnetism, and many other observations. Buoys with records will be left all along the route, in order to test the rate of the currents, and the same will be done with reference to air-currents by means of small balloons. Any islands discovered would be, of course, surveyed. Surveying parties will also be despatched across the ice, communication with the ship being maintained by wireless telegraphy, and provisions carried in hollow tubes of aluminium to be left at 1-mile intervals along the route. The time necessary for the voyage is estimated at four years. Captain Bernier, who comes of a family of sea-captains, over 300 years of service having been made up by his own and the two preceding generations, brings unbounded enthusiasm to his task. As stated last month, he hopes to have the financial support of the Canadian Government.

GENERAL.

Medal awarded to Dr. Donaldson Smith.—At a recent meeting of the Philadelphia Geographical Society, the Elisha Kent Kane medal, awarded by the

Society to distinguished explorers, was presented to Dr. Donaldson Smith for his valuable surveys in East Africa. The president of the Society, by whom the presentation was made, is the only surviving member of the Kane Polar expedition in honour of whose leader the medal was instituted. A large part of Dr. Smith's collections will be presented by him to the Philadelphia Academy of Naturas Sciences.

Death of Otto Kersten.—One of the pioneers of exploration in East Africa has lately passed away in the person of Otto Kersten, the companion of Baron von der Decken in his well-known journeys to Mount Kilimanjaro and the Jub river. From a short notice of the traveller by Dr. R. Andree, which appears in a recent number of *Globus*, we learn that Kersten, who at the time had just completed his course of scientific study at Berlin, was recommended to Von der Decken as travelling companion by the famous explorer Barth. After the death of his leader in East Africa, Kersten, assisted by a staff of scientists, brought out the excellent account, in four volumes, of Von der Decken's journeys. He has since been zealous in the promotion of German interests in East Africa, and even so far back as 1869 had formed a project for the acquisition of territory for Germany in that region. For a time he was chancellor of the German consulate at Jerusalem, but, apart from a journey to Marocco with his wife in 1883, lived most of his time either at Berlin or at his paternal town of Altenburg, where he died on November 22 last, aged sixty-one.

Death of the Surgeon of the Borchgrevink Expedition.—We regret to learn that Dr. Herlof Klövstad, surgeon of the recent expedition under Mr. Borchgrevink to South Victoria Land, died on December 29 last at Tromsö, at the age of thirty-two, of typhus fever. He had proved a most efficient member of the staff of the expedition, besides endearing himself to all his associates by his genial character, and to him was due the discovery that insects exist in South Victoria Land. His death is the third, including that of Dr. Hanson, who died during the wintering in the antarctic, which has occurred among the members of the expedition.

A New Anthropological Publication.—Under the simple but comprehensive title *Man*, the Anthropological Institute has commenced the publication of a new serial devoted to the furtherance of Anthropological Science. It will be issued in monthly parts, and the first of these, which appeared in January, consists of 16 pages of large 8vo. size. It is well printed and provided with several illustrations, including a heliochrome plate. The contents are for the most part reviews, but interspersed with these are a certain number of original communications. A somewhat novel practise is adopted for purposes of reference, each review or article receiving its own number, which may be quoted instead of the page on which it appears. The new publication should do good service in popularizing the important study of Mankind.

OBITUARY.

Luciano Cordeiro.

In Luciano Cordeiro, who died at Lisbon on December 22, Portugal has lost one of her most distinguished geographers. Born on June 21, 1844, at Mirandella, a

picturesque little town of Traz-os-Montes, Cordeiro received his early education at Lisbon and Funchal. He entered the Royal Navy as an Aspirante (midshipman), but soon retired from the service, and, having passed through the Escola superior de Letras of Lisbon, determined to devote his energies to the pursuit of literature, journalism, and geographical studies. For a time he occupied the chair of philosophy and literature of the Military College, and one of his earliest publications was a collection of bright essays, 'Livro de Critica' (Lisbon, 1869–71). In 1873 he founded the *Revista de Portugal e Brasil*, but only two volumes of this promising magazine saw the light. A leisurely journey through Spain, France, southern Germany, and Italy was described by him in a work of travels, 'Viagems' (Lisbon, 1874–5). In 1879–80 Cordeiro was editor of an important daily paper, the *Jornal de Commercio*, and subsequently he edited the *Diario de Lisboa*. Having been elected a member of the Chamber of Deputies, he vigorously stood up in defence of Portuguese claims in Africa, and wrote a number of pamphlets in the vain hope of convincing foreign powers of their justice. In 1884 he was one of the representatives of Portugal at the Berlin Congress.

But what entitles him more especially to recognition among geographers is the foundation of the Lisbon Geographical Society in 1875, for it was mainly due to his indefatigable exertions that this society, notwithstanding its occasional incursions into the domain of politics, has done much to extend our knowledge of the Portuguese colonies. Cordeiro was elected its first secretary, and held that honourable position up to his death. Numerous papers were communicated by him to the *Boletim* of that society, or published by it separately. Nearly all of these will be found in our library, but only the more important need be mentioned in this obituary. In 1878 he published 'L'hydrographie africaine au Siècle xvi.,' by which he sought to prove that the Portuguese, long before the days of Livingstone, had a fair knowledge of the interior and its vast lakes. The attempt proved a failure. D'Anville in 1737, Ludolfus even earlier, had rejected these claims, and competent modern geographers felt bound to agree essentially with their verdict. In 1881 Cordeiro published 'Memorias do Ultramar,' a collection of documents for the most part hitherto unpublished, dealing with Portuguese explorations and enterprise in Western Africa, and especially in Congo and Angola, between 1516 and 1622. In 1892 he published essays on Vasco da Gama, and his elevation to the peerage as Conde de Vidigueira; on Diogo d'Azambuja, the builder of the famous Fort of Elmina; and the pillars erected by Diogo Cão. His contribution to the Fourth Centenary of the Discovery of India was an account of the loss of Ormuz ('Como se perdeu Ormuz') in 1622, and of the action brought by the Portuguese Government against Jorge de Albuquerque, whose father was held responsible for the loss, because he had neglected to furnish means for the defence of the place. Shortly before Cordeiro's death appeared the first instalment of 'Annotacões Historicas,' another collection of documents illustrating Portuguese history. These essays and collections of documents, together with their valuable commentaries, no writer on early Portuguese geographical explorations or colonial history can afford to neglect.

In 1887 the Lisbon Geographical Society awarded its founder a gold medal "in recognition of his services to civilization and the fatherland."* The Royal Geographical Society recognized his merits by electing him one of its corresponding members.

E. G. R.

* See Borges de Figueiredo's 'Homenagen a Luciano Cordeiro,' with portrait, 1887.

Serpa Pinto.

Alexandre Alberto da Rocha de Serpa Pinto, the well-known African explorer, who died at Lisbon in December, was born on April 20, 1846, at Castel Polchras on the Douro. In 1848 his family emigrated to America. On their return, in 1858, Serpa Pinto entered the Military College, and in 1864 received a commission in a battalion of Chasseurs. In 1869 he was attached to a column of Portuguese troops operating against revolted natives on the lower Zambezi. It was intended that on the termination of this war Serpa Pinto should be placed at the head of an expedition charged with a survey of the upper Zambezi, but this intention was never carried out, and he returned to Europe after a "hasty run through the Portuguese possessions of East Africa."

His ardent desire, however, to take a share in the exploration of Central Africa was to be fulfilled a few years later. In 1877 Lieut. H. Capello, of the Portuguese navy, was placed at the head of an expedition the main object of which was the exploration of the upper Kunene and the Kwango, and with him were associated Captain Serpa Pinto and Lieut. R. Ivens. The explorers left Beaguella on November 12, 1877, but very soon the relations between Serpa Pinto and his colleagues became strained. Serpa Pinto complained that he had been abandoned in Caconda, absurdly described as a "dangerous and hostile country," although he had with him the best men of the expedition. Fresh disagreements arose in Bihe, and the explorers parted company. Capello and Ivens, in accordance with their instructions, turned to the northward, doing most excellent service, whilst Serpa Pinto, fired no doubt by the fame recently won by Cameron and Stanley, turned his face eastward. On June 14, 1878, he crossed the Kwanzo, and on August 24 he arrived at Lialui, the capital of the Marutse. This route, no doubt, had been traversed before by Silva Porto and by other traders from Bihe, but it is Serpa Pinto's merit to have laid it down for the first time with approximate correctness upon a map.

The explorer intended to continue still further east, as far as the meridian of Zumbo, but his intentions were frustrated, as he avers, by the intrigues of Silva Porto's negroes, whose hostility had been aroused by his "unceasingly waging war against his traffic in slaves." His camp was attacked on September 6, and soon afterwards all his carriers deserted him. Fortunately the king of the Marutse proved his friend, and furnished him with boats, which enabled him to descend the Zambezi. When he reached the camp of the Rev. F. Coillard, on October 20, he had come to the end of his resources, and he speaks of this enterprising missionary as "the man who saved him, and in doing so saved the labours of the expedition which I directed." Serpa Pinto arrived at Pretoria on February 12, 1879, which was at that time occupied by British troops, and on April 19 embarked at Durban for Europe. The results of this expedition were published in London in 1881, both in Portuguese and English ('Como eu atravessei Africa' and 'How I crossed Africa'), and having been translated into French, German, and Italian, won the author universal fame as one of the most successful African explorers. The Royal Geographical Society awarded him the Founder's Medal in 1881, and elected him as hon. corresponding member.

A second opportunity for winning fame as an explorer was afforded Serpa Pinto in 1884, when he was placed at the head of an expedition whose object it was to explore the region between Mozambique and the Nyasa, and possibly also the country beyond that lake. After much delay caused by the difficulty of procuring carriers, the expedition left Mozambique on November 13, 1884, and following the coast, arrived at Kisanga, opposite Ibo, on February 14, 1885. Serpa Pinto,

owing to ill health, was compelled to retire from the leadership and the command devolved upon Lieut. Cardozo, who, bravely struggling against difficulties, managed to conduct his caravan to Lake Nyasa. In February, 1886, he turned up at Blantyre, with three men only, in search of food, and thence returned straight to Kiliman, where he arrived in May.

Once more we meet with Serpa Pinto in Eastern Africa, in 1890, at the head of a military expedition, prepared to extend Portuguese influence along the Shire to the northward. His plans, however, were defeated by the decisive action of Sir H. Johnston; and by the treaty of May 28, 1891, the upper Shire and the western shore of Nyasa were recognized as lying within the British sphere.

E. G. R.

The Hon. David Carnegie.

It is with deep regret that we record the death, which occurred in Nigeria on November 27 last year from a wound by a poisoned arrow, of the Hon. David Carnegie, youngest son of the Earl of Southesk, one of the most promising and successful of the younger generation of British pioneers in new lands. Although not yet thirty years old at the time of his death, Mr. Carnegie had made his mark as both a capable organizer and leader, having, during the course of his work in Nigeria, been singularly successful in gaining the love and respect of those under him, his influence over whom is described as almost magical.

Born in London on March 23, 1871, David Carnegie was educated at the Charterhouse and at the Royal Indian Engineering College at Cooper's Hill, at the latter of which he paid special attention to surveying. It was not long before his studies in this direction were turned to good account, for, having in 1892 taken up an appointment in connection with certain of the goldfields of Western Australia, he soon turned his attention to prospecting in the less known districts of the colony. In 1896 he organized, entirely at his own expense, a more important undertaking in the form of an exploring expedition through previously unvisited portions of the great Australian desert. The party led by him consisted entirely of his own men, and the journeys were conducted without loss, save of one man who died from an accident, and three camels that were poisoned. Starting from a point due north of Coolgardie, in 28½° S., the expedition soon plunged into the great spinifex desert, which was crossed from south-west to north-east, or diagonally to the routes of the few preceding explorers of this region, almost to 18° S.; the return route being varied so as to extend the area of the surveys. The journey was one requiring a large amount of pluck owing to the known scarcity of the water-supply, which makes the explorer in this region dependent entirely on his camels for safety and success. The results were valuable from a geographical point of view, although naturally no startling discoveries could be expected. Mr. Carnegie described his journey at a meeting of the Society in February, 1898, and his paper, illustrated by his own vivid sketches of scenery, was shortly afterwards published in the eleventh volume of the *Journal*. A fuller account was subsequently given in the excellently written volume entitled 'Spinifex and Sand.'

About a year ago Mr. Carnegie obtained an appointment under General Lugard in the Nigeria Protectorate, and a new field for pioneer work of the kind for which he was so peculiarly fitted was opened to him. On returning from a tour through the west of Ilorin, he received the special commendation of the Commissioner, who expressed himself much pleased with his survey and report. He also gained the confidence of the natives in a surprising degree, and pressing requests were received by Sir F. Lugard from the Emir of Ilorin that he might be sent back to that

district. Among other work entrusted to him was the settlement on behalf of the Government of Nigeria of the frontier between that Protectorate and Lagos. According to the latest news received, it was on November 22 that Carnegie was entrusted with the mission which was soon to end so tragically. A native chief had been raiding on the bank of the Niger, some 25 miles from Lokoja, whence Mr. Carnegie was despatched with a small force to quell the disturbance. The refractory chief had fled, but complaints having been made of the conduct of the King of Tawaii, Mr. Carnegie resolved to proceed thither and arrest him. The place was found deserted, and the return march was begun, but the small party was at once attacked by concealed natives, the leader being hit by an arrow on the thigh. Fifteen minutes later he was dead, but his body was gallantly rescued and brought to Lokoja by his devoted followers. By his death a most promising career has been cut short.

CORRESPONDENCE.

The Circumnavigation of Africa related by Herodotus.

I WISH to make a contribution to the literature of this much-disputed narrative, to which Dean Vincent devoted considerable space in his book, in order to disprove the possibility of the voyage, and I hope it will appear that after all there is no such great improbability in the story. Prof. Heeren supports the accuracy of the account.*

Dean Vincent was not a traveller or seafaring man, and in his day much less was known about the coasts than at present. It must be remembered that the adventurous voyagers did not go altogether voluntarily, and it would have been death to return with their task unaccomplished; and also that the voyage was far less difficult than the voyage in the opposite direction would have proved. I will just quote the account of Herodotus.† "As for Lybia, we know it to be washed on all sides by the sea, except where it is attached to Asia. This discovery was first made by Necos, the Egyptian king (616 B.C.), who sent to sea a number of ships manned by Phœnicians, with orders to make for the pillars of Hercules, and return to Egypt through them, and by the Mediterranean. The Phœnicians took their departure from Egypt by way of the Erythræan sea, and so sailed into the Southern ocean. When autumn came, they went on shore wherever they might happen to be, and having sown a tract of land with corn, waited until the grain was fit to cut. Having reaped it, they again set sail, and thus it came to pass that two whole years went by, and it was not till the third year that they doubled the pillars of Hercules and made good their voyage home. On their return, they declared—I, for my part, do not believe them, but perhaps others may—that in sailing around Lybia they had the sun upon their right hand. In this way was the extent of Lybia discovered."

It has been before remarked that the mention of the circumstance, to Herodotus so incredible, that a ship sailing to the westward should have the sun on the right hand, affords the strongest proof of the reality of the voyage. I wish to quote here, in comparison with the above, what is known to have been done. It is a quotation from Faria y Souza.‡ "After the taking of Diu, September 21, 1536, there was

* 'Hist. Researches,' etc., by A. H. L. Heeren. Oxford: 1833. D. A. Talboys.
† 'History of Herodotus,' by Geo. Rawlinson, M.A. 1875.
‡ Kerr's 'Collection,' 1824, vol. vi.

a person named Diego Botello residing at Diu, who was in disgrace with the King of Portugal, on account of its being reported that he intended to go over to the French in hopes of high promotion, as he was very conversant in the affairs of India (evidently so, from what follows). Knowing how earnestly King Joam had desired the establishment of a fort at Diu, he resolved on endeavouring to be the first messenger of this news. For this purpose, having procured a copy of the treaty, and a draught of the intended fort, he embarked in a small vessel, only *sixteen feet and a half* long, *nine feet* broad, and four feet and a half deep, manned by his own slaves, with three Portuguese and two others, giving out that he was going to Cambaya. But when out at sea, he informed his companions that he meant in this frail bark to traverse the prodigious extent of ocean between India and Portugal, and prevailed on those along with him to concur in his design. Being reduced to unspeakable miseries, the slaves, who were the only mariners on board, entered into a conspiracy to kill him, and even killed one of his servants, but were all slain. Being now without seamen or pilot, he held on his course, and arrived at Lisbon, to the astonishment of every one. Botello was restored to the royal favour for this wonderful action, but received no other reward, and the boat was immediately destroyed, that it might not be known so small a vessel was capable of performing so great a voyage."

The Phœnicians had sufficient skill to navigate the Mediterranean and Red sea—both stormy basins, and there is a presumption, if not more, that they were, from very early times, acquainted with the east coast of Africa and the Mozambique—witness the ruined cities lately discovered in South Africa. That by taking advantage of the seasons, they might round the Cape of Good Hope, and proceed up the western coast of Africa, does not seem to me improbable. If it be asked, why did no practical results follow this wonderful voyage? it may be that it was not found to be of practical use commensurate with the dangers and length of time occupied, or, if it really led to the discovery of the South African goldfields, that it was intentionally kept secret. We know too little about those times to make a conjecture.

I need not refer to the marvellous voyages made of late years in small boats, sometimes with only one occupant. The chief object of this note is to give prominence to Botello's exploit, and its correlation with Herodotus' story, which I believe to be based on fact, not fiction.

ARTHUR W. STIFFE, late I.N.

Re "The Discovery of the Barriloche Pass."

Under the title of "Discovery of the Barriloche Pass," the *Journal* (vol. xvii. p. 79) contains an abstract of some notes which have appeared in *Globus* (vol. 78, p. 182), and *Petermanns Mitteilungen* (1900, p. 218), in which the rediscovery of the Barriloche pass in the Patagonian Andes is credited to the Chilian, Captain Barrios. This statement is incorrect. I myself, in 1880, discovered on the shores of an unknown lake tributary of Lake Nahuel Huapi (Lake Gutierrez) some pieces of wood carved by Europeans, and referred to in my geographical publications, I considering them as remains of the rafts of Jesuit missionaries, and the spot as a part of the Barriloche route. In 1898, my assistants, surveying the region to the west of this Lake Gutierrez, rediscovered the famous gap, and photographs of both slopes can be seen on pp. 746 and 747 of the 'Argentine-Chilian Boundary, Argentine Evidence,' published in London last year.

The exploration of Captain Barrios was carried on two years after, he using the tract opened by the Argentine surveyors.

FRANCISO P. MORENO.

January 13, 1901.

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1900-1901.

Fourth Ordinary Meeting, January 14, 1901.—Sir T. H. HOLDICH, R.E., K.C.I.E., C.B., Vice-President, in the Chair.

ELECTIONS.—*Edmund Backhouse; Captain Frank Bevan (5th Fusiliers); Ebenezer Clarke; Alfred Edwin Clements; William Brownfield Craig; Samuel Blackwell Fenn, L.R.C.P., L.R.C.S.; Salamon Israel; Charles Davis Jameson, C.E.; George Cecil Lyne Pirkis, B.A.; Captain Henry Joseph Wilson; Gustave Zimmer.*

The Paper read was:—

"Explorations in the Canadian Rocky Mountains." By Prof. Norman Collie, F.R.S.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian*, R.G.S.

THE following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are in each case written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Com. = Commerce.
C. Rd. = Comptes Rendus.
Erdk. = Erdkunde.
G. = Geography, Geographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
k. u. k. = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. = Memoirs, Mémoires.
Met. = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. = Review, Revue.
S. = Society, Société, Selskab.
Sitzb. = Sitzungsbericht.
T. = Transactions.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo, quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half-inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Alps—Morphology. **Richter.**

Geomorphologische Untersuchungen in den Hochalpen. Von Dr. Eduard Richter. (Dr. A. Petermanns Mitteilungen. Ergänzungsheft Nr. 132.) Gotha: Justus Perthes, 1900. Size 11 × 7½, pp. vi. and 104. *Illustrations. Price* 6 *m.* 40 *pf.*

This will be specially noticed.

Alps—Soil and Vegetation. *Die Natur* **49** (1900): 577–578. ——

Beziehungen zwischen Bodenbeschaffenheit und Flora in den Alpen.

Austria—Croatia. *Deutsche Rundschau G.* **23** (1900): 108–111. **Hranilović.**

Der Švicasee in Kroatien. Von Dr. H. v. Hranilović.

Lake Švica lies among the spurs of the Belebit, near the town of Otočac.

Austria—Hungary. *Questions Dipl. et Colon.* **10** (1900): 86, 142, 463, 529. **Beaumont.**

La problème austro-hongrois et sa portée européenne. Par W. Beaumont.

Belgium—Place-names. *B.S.G. Lille* **34** (1900): 286–294. **Houbron.**

Zigzags étymologiques à travers la Flandre. Par M. G. Houbron.

France—Gironde. *B.S.G. Com. Bordeaux* **26** (1900): 420–424. **Courty.**

Régime de la température dans le département de la Gironde. Par F. Courty.

France—Havre. *Questions Dipl. et Colon.* **10** (1900): 657–673. **Hanotaux.**

Le Havre et le commerce maritime de la France. Par G. Hanotaux.

France—Paris Basin. *Ann. G.* **9** (1900): 313–339, 413–433. **Dollfus.**

Relations entre la structure géologique du bassin de Paris et son hydrographie. Par G. F. Dollfus. *With Maps.*

France—Rhone Valley. *B.S.G. Lille* **34** (1900): 205–233. **Ronjat.**

La vallée du Rhône de Lyon à Avignon. Par M. Jules Ronjat. *Map.*

Germany—Coasts. *Ann. Hydrographie* **28** (1900): 536–541. **Herrmann.**

Die Eisverhältnisse an der deutschen Küste im Winter 1899–1900. Von E. Herrmann.

Germany—Elbe. *La G., B.S.G. Paris* (1900): 363–370. **Chudeau.**

L'Elbe, son régime et son importance économique. Par M. R. Chudeau.

Based on the recent German official publication on the Elbe (see *Journal*, vol. xvi. p. 552).

Germany—Harz Mountains. *J. Manchester G.S.* **16** (1900): 69–105. **Mellor.**

The Harz Mountains, with Brunswick and Hildesheim. By E. W. Mellor. *With Sketch-map and Illustrations.*

Germany—Lakes. *Globus* **78** (1900): 121–127. **Werner.**

Die oberelsässischen Seen und Stauweiher. Von L. G. Werner. *Illustrations.*

A description of the lakes of the upper region of the Vosges, now for the most part converted into reservoirs.

Germany—Prussia. **Cohen and Deecke.**

VII. Jahresb. G. Ges.-Greifswald (1898–1900): 41–46.

Liste der häufigeren Rügen'schen Diluvial-geschiebe. Von E. Cohen und W. Deecke. *With Map.*

Germany—Prussia. *VII. Jahresb. G. Ges. Greifswald* (1898–1900): 1–9. **Credner.**

Lage, Gliederung und Oberflächengestaltung der Insel Rügen. Von Rudolf Credner. *With Map.*

Germany—Prussia. *VII. Jahresb. G. Ges. Greifswald* (1898–1900): 10–40. **Deecke.**

Die geologische Zusammensetzung und Schichtenfolge der Insel Rügen. Von W. Deecke.

Germany—Prussia. *VII. Jahresb. G. Ges. Greifswald* (1898–1900): 142–157. **Metzner.**

Die älteste Stadtbeschreibung von Greifswald. Von J. E. Metzner.

The account of Greifswald here referred to was written about 1593 by Lucas Takke.

Germany—Prussia. **Reifferscheid.**

VII. Jahresb. G. Ges. Greifswald (1898–1900): 99–141.

Aus der Geschichte zweier Dörfer in Pommern. Ein Beitrag zur pommerschen Heimatskunde. Von Geheimrat Dr. A. Reifferscheid. II.

Historical sketch of Lubmin, a Baltic watering-place. A former article in the same publication treated of Fresendorf.

Germany—Prussia. *G.Z.* **6** (1900): 435–449, 504–512, 549–565. **Stavenhagen.**

Die geschichtliche Entwickelung des preussischen Militär-Kartenwesens. Von W. Stavenhagen.

A full and clear account of the progress of military cartography in Prussia.

Germany—Prussia—Masuren. **Zweck.**

Masuren. Eine Landes- und Volkskunde, von Dr. Alb. Zweck. (Deutsches Land und Leben in Einzelschilderungen. Landschaftskunden und Städtegeschichten.) Stuttgart: Hobbing & Büchle, 1900. Size 8½ × 6, pp. vi. and 358. *Maps and Illustrations. Price 7s.*

This is one of a series of studies in regional geography which are to be devoted to various parts of the German Empire. It deals with the south-eastern portion of the province of East Prussia, inhabited by the Mazures, a Polish people whose occupation dates, in its first beginnings, from the fourteenth century. The work begins with a clear sketch of the physical features of the country, which includes a portion of the ridge of comparatively elevated ground parallel to the Baltic coast, and also a depressed area largely occupied by lakes. The last half of the book treats very fully of the various elements of the population, its history, industries, culture, etc.

Germany—Prussia—Silesia. *Globus* **78** (1900): 297–300, 321–325. **Tetzner.**

Die Tschechen und Mährer in Schlesien. Von Dr. F. Tetzner. *With Illustrations.*

Germany—Schleswig-Holstein. ——

Excursion nach Ost-Schleswig-Holstein und der Insel Sylt am 5.—10. Juni 1900. (XVII. Excursion der Geographischen Gesellschaft zu Greifswald.) Greifswald, 1900. Size 9 × 6, pp. 22. *Maps.*

The excursion described was undertaken for the comparative study of the coasts and islands of the North sea and Baltic.

Greece—Paxos and Antipaxos. **Martelli.**

Atti R.A. Lincei, Rendiconti **9** (2 Sem.) (1900): 282–286.

Note geologiche su Paxos e Antipaxos nelle Isole Ionie. Nota del Dott. Alessandro Martelli.

Italy—Lakes. *Riv. G. Italiana* **7** (1900): 450–468. **Marinelli.**

Seconda serie di aggiunte e correzioni al Catalogo dei laghi italiani. Di Olinto Marinelli.

Revision of the statistical data relative to the Italian lakes published in 1894–95.

Portugal—Bragança. *B.S.G. Lisboa* **17** (1898–1899): 151–264. **Lopo.**

Bragança e Bemquerença. Por Albino dos Santos Pereira Lopo. *With Map, Plans, and Illustrations.*

Descriptive and Historical notes on Bragança and its buildings, particularly the fortifications.

Rumania. *Globus* **78** (1900): 117–121. **Weigand.**

Bulgarische Siedelungen in Rumänien. Von Prof. G. Weigand. *Illustrations.*

Russia. **Woodhouse.**

Waterway between the Baltic and Black Sea. Foreign Office, Miscellaneous, No. 529, 1900. Size 10 × 6½, pp. 12. *Price 1d.*

See note in *Journal*, vol. xvi. p. 554.

Switzerland—Jura. *Scottish G. Mag.* **16** (1900): 630–651. **Dingelstedt.**

The Valley of the Joux (Jura). By Victor Dingelstedt.

A clear sketch of the physical geography of the Joux valley, and the effect this has had on its inhabitants.

United Kingdom—Coal. *La G., B.S.G. Paris* (1900): 356–362. **Levasseur.**

La houille britannique et la question de l'épuisement. Par M. E. Levasseur.

Without committing himself to any estimate of the duration of the coal-supply of Great Britain, M. Levasseur dwells on the need of husbanding the same.

United Kingdom—Mines and Quarries. **Foster.**

Mines and Quarries: General Report and Statistics for 1897. Part iv.—Colonial and Foreign Statistics. Statistics relating to persons employed, output, and accidents at Mines and Quarries in the British Colonies and in Foreign Countries. Edited by C. Le Neve Foster, D.SC. London: Eyre & Spottiswoode, 1899. Size 13½ × 8½, pp. 273–416. *Diagrams. Price 1s. 7d.*

United Kingdom—Mines and Quarries. **Foster.**

Mines and Quarries: General Report and Statistics for 1899. Part iii.—Output. General Report and Statistics relating to the output and value of the Minerals raised in the United Kingdom, the amount and value of the metals produced, and the exports and imports of Minerals. Edited by C. Le Neve Foster, D.SC. London:

Eyre & Spottiswoode, 1900. Size 13½ × 8½, pp. 119–274. *Diagram.* *Price* 1*s.* 5*d.* *Presented by the Home Office.*

United Kingdom—Oxford. *P.R.S.* **67** (1900): 218–222. **Rambaut.**

Underground Temperature at Oxford in the Year 1899, as determined by Five Platinum Resistance Thermometers. By Arthur A. Rambaut, D.SC. [Abstract.]

United Kingdom—South Downs. *P.I. Civil Engineers* **142** (1900): 342–351. **Whitley.**

The Underground Water-Levels of the South Downs between Eastbourne and the River Cuckmere. By H. M. Whitley. *With Plan and Section.*

Recent investigations have shown that, except where the chalk downs are drained by the deep valleys of Friston and Eastdean, the underground water contours roughly follow the surface contours.

United Kingdom—Statistics. **Fox.**

Report by Mr. Wilson Fox on the Wages and Earnings of Agricultural Labourers in the United Kingdom, with Statistical Tables and Charts. London: Eyre & Spottiswoode, 1900. Size 13½ × 8½, pp. x. and 296. *Price* 3*s.* 4*d.*

ASIA.

Central Asia. **Deasy.**

Journeys in Central Asia. By Captain H. H. P. Deasy. (From the *Geographical Journal* for August and November, 1900.) Size 10 × 6½, pp. 50. *Map and Illustrations.*

China. *B. American G.S.* **32** (1900): 334–340. **Fischer.**

Through the Silk and Tea Districts of Kiang-Nan and Chekiang Province. By Emil S. Fischer.

On a journey, mainly by boat, from Shanghai to Hang-chau and Ningpo.

China—Chekiang. *B.S.G. Com. Havre* **17** (1900): 39–45. **Richard.**

Le Tche-Kiang. Par M. Garston Richard.

Review of a monograph by Dr. M. Carli, published at Rome in 1899.

China—Liao-tung Peninsula. **Bogdanovitch.**

Description géologique de l'extrémité sud de la presqu'île de Liao-toung (région de Kouang-toung) et de ses gisements d'or. Par K. Bogdanovitch. [In Russian; *résumé* in French.] Materialien zur Geologie Russlands. Herausgegeben von der K. Mineralogischen Gesellschaft. Band xx., pp. 1–248. St. Petersburg, 1900. Size 10 × 7.

China—Yunnan. *Rev. Française* **25** (1900): 636–641. **Leclère.**

La charbon au Yunnan. Par A. Leclère.

M. Leclère holds that the extensive coal deposits between Tongking and the Yangtse are of a quality not only unknown in Tongking, but rare in Europe or China.

Chinese Empire—Manchuria. *Rev. Française* **25** (1900): 719–723. **Servigny.**

La Mandchourie grenier de l'Amour. Par J. Servigny.

Eastern Asia. **Barthold.**

Russische Arbeiten über Ostasien. Jahresbericht für 1899. Von W. Barthold. (Mittheilungen des Seminars für Orientalische Sprachen zu Berlin. Jahrg. iii. Erste Abth. Ostasiatische Studien. Pp. 233–238.) Berlin and Stuttgart: W. Spemann, 1900.

Contains a short summary of the contents of the principal works published in 1899 by Russian scientific societies.

Eastern Asia. **Brandt.**

Dreiunddreissig Jahre in Ost-Asien. Erinnerungen eines deutschen Diplomaten. Von M. von Brandt. Band i. Leipzig: G. Wigand, 1901 [1900]. Size 9 × 6, pp. xii. and 320. *Portrait.* *Price* 6*s.* 6*d.*

In this volume the author gives his personal reminiscences of the Prussian mission to Eastern Asia in 1860–62, in which he took part as *attaché*. In view of the attention now focussed on the far East, the account, by a careful observer, of the condition of affairs in that part of the world thirty years ago possesses a considerable interest, if only for the means it affords of comparison between the past and present. The countries dealt with are Japan, China, and Siam.

Japan—Saris's Voyage. **Satow.**

The Voyage of Captain John Saris to Japan, 1613. Edited from Contemporary Records by Sir Ernest M. Satow, K.C.M.G. London: Printed for the Hakluyt Society, 1900. Size 9 × 6, pp. lxxxviii. and 242. *Map and Illustrations. Presented by the Hakluyt Society.*

This voyage possesses a special interest as the first attempt on the part of the East India Company to extend its operations to the Japanese Empire. The introduction contains valuable notes on Saris's previous and subsequent career, and on early European commercial dealings with the Far East.

Malay Archipelago—Java. **Brandes.**

Tijds. Indische Taal-, Land- en Volkenk. **42** (1900): 105–130.

Van Oud-Batavia, losse mededeelingen. Door Dr. J. Brandes.

On the topography of Old Batavia, as shown by views and plans chiefly of the eighteenth century.

Malay Archipelago—Java. **Gelder.**

Tijds. K. Ned. Aard. Genoots. Amsterdam **17** (1900): 765–788.

De Residentie Bantam; Plaatsbeschrijving en bevolking. Door W. van Gelder.

Malay Archipelago—Java. **Niermeyer.**

Tijds. K. Ned. Aard. Genoots. Amsterdam **17** (1900): 735–764.

De vulkaan Idjèn in Besoeki. Door J. F. Niermeyer. *With Map and Illustrations.*

On the little-known volcanic group of Ijen in the extreme east of Java.

Malay Archipelago—Java. **Porte and Knebel**

Tijds. Indische Taal-, Land- en Volkenk. **42** (1900): 263–296.

De Ruïnen van Panataran. Aanteekeningen van J. André de la Porte en J. Knebel.

Description of the great ruined temple at Panataran, in the Kediri residency, Java

Malay Archipelago—Magnetism. **Bemmelen.**

K.A. Wetens. Amsterdam, P. Section Sci. **2** (1900): 202–211.

Dr. W. van Bemmelen. "Spasms" in the terrestrial magnetic force at Batavia.

On the probable existence of very small magnetic disturbances not hitherto noticed.

Malay Archipelago—Manila Observatory. **Algué.**

National G. Mag. **11** (1900): 427–438.

The Manila Observatory. By Rev. Father José Algué, S.J. *With Illustrations.*

Sketch of the work done at the Manila Observatory since its inauguration in 1865.

Malay Archipelago—Philippines. **Sawyer.**

The Inhabitants of the Philippines. By Frederic H. Sawyer. London: Low & Co., 1900. Size 9 × 6, pp. xxviii. and 422. *Maps and Illustrations. Price* 14*s. net. Presented by L. W. Longstaff, Esq.*

The writer, who, during a residence of fourteen years in Luzon, had exceptional opportunities of becoming acquainted with all phases of native and European life in the Philippines, was led to write this book by a wish to set forth the natives in a more favourable light than has been done by most recent writers. This more favourable estimate is extended also in part to the Spanish administration. The first half of the book deals with the general history, geography, resources, etc., of the group, while the second treats in detail of the various tribes, with abundant photographic illustrations.

Malay Archipelago—Sumatra. **Van der Stok.**

K.A. Wetens. Amsterdam, P. Section Sci. **2** (1900): 178–189.

Tidal Constants in the Lampong- and Sabang-bay, Sumatra. By Dr. J. P. van der Stok.

Persia. *Deutsche Rundschau G.* **23** (1900): 10–14. **Schulz-Baumgärtner.**

Wie man in Persien reist. Von Dr. W. Schulz-Baumgärtner. *Illustrations.*

Persia. *G.Z.* **6** (1900): 537–549. **Stahl.**

Persien und seine Beziehungen zu den Nachbarländern. Von A. F. Stahl.

Includes a description of the principal trade-routes and a discussion of the railway question.

Russia—Caucasus. *Rev. G.* **47** (1900): 100–116, 173–187, 241–257. **Baye.**

Tiflis. Souvenirs d'une mission. Par le Baron de Baye. *With Illustrations.*

Descriptive and Historical notes. The date of the visit is not mentioned.

Russia—Siberia. **Patkanoff.**

Erläuterungen zur ethnographischen Karte des Tobolskischen Kreises. Size 12 × 9, pp. 6. *Map.*

The map is intended to illustrate the description of the Ostiaks of the Irtish, by the same author.

Russia—Siberian Railway. *Scottish G. Mag.* **16** (1900): 617–630. **Beazley.**

The Siberian Railway. By C. Raymond Beazley.

An account of the history of the Siberian Railway project, with notes on its actual and probable economic results.

Russia—Siberian Railway. **Cooke.**

Trans-Siberian Railway. Foreign Office, Miscellaneous, No. 533, 1900. Size 10 × 6½, pp. 30. *Sketch-map. Price* 3½*d.*

Sketches the history of the Siberian Railway project and its probable influence on Siberian trade and settlement, with a section on the resources, etc., of the country.

Russia—Siberian Railway. *Deutsche Rundschau G.* **23** (1900): 27–31. **Grunzel.**

Die transsibirische Eisenbahn. Von Dr. Josef Grunzel. *Map and Illustrations.*

Russian Central Asia. *G. Tidskrift* **15** (1899-1900): 177–194. **Olufsen.**

Den anden danske Pamir-Expedition. Af O. Olufsen. *With Map and Illustrations.*

On Lieut. Olufsen's limnological investigations on the Alichur Pamir.

Tian Shan. *G.Z.* **6** (1900): 512–518. **Immanuel.**

Der Tiën-Schan. Von Immanuel.

Summarizes the main results of Dr. Friederichsen's study of the Tian Shan noticed in the *Journal*, vol. xiv. pp. 443, 661.

Turkey—Nikaria Island. *B.S.R.G. d'Anvers* **24** (1900): 329–363. **Hauttecœur.**

L'ile d'Icaria. Par M. H. Hauttecœur.

Based on the Greek work of M. Stamatiades, published in 1893.

Turkey—Palestine—Ancient Map. **Schulten.**

Die Mosaikkarte von Madaba und ihr Verhältnis zu den ältesten Karten und Beschreibungen des heiligen Landes. Von Adolf Schulten. (Abhandlungen der Königl. Gesellschaft der Wissenschaften zu Göttingen. Philologisch-Historische Klasse. N. F. Band iv. No. 2.) Berlin: Weidmannsche Buchhandlung, 1900. Size 11 × 9, pp. 122. *Facsimiles. Price* 9*s.*

The map here described, which occupied the floor of an ancient church at Madaba east of the Jordan, was discovered in 1896 by Pater Kleophas, librarian of the Greek monastery at Jerusalem.

Turkey—Rhodes. *Tour du Monde* **6** (1900): 457–480. **Launay.**

L'Ile de Rhodes. Par M. L. de Launay. *With Illustrations.*

Turkey—Syria. *M.G. Ges. Wien* **43** (1900): 194–197. **Blanckenhorn.**

Zur Frage des Untergangs von Sodom und Gomorrha. Von Dr. Max Blanckenhorn.

A reply to Dr. Carl Diener's criticism of a former article of the author on the origin of the Dead sea.

AFRICA.

Africa—South and East Coasts. ——

Supplement, 1900, relating to the Africa Pilot. Part iii. Sixth Edition, 1897. London: J. D. Potter, 1900. Size 10 × 6½, pp. 50. *Price* 8*d. Presented by the Hydrographer to the Admiralty.*

British East Africa—Uganda. **Johnston.**

Preliminary Report by her Majesty's Special Commissioner on the Protectorate of Uganda. (Africa, No. 6, 1900.) London: Eyre & Spottiswoode, 1900. Size 13½ × 8½, pp. 16. *Price* 2*d. Maps separate* (Africa, No. 8, 1900). *Price* 1*s.* 6½*d.*

This is specially referred to, *ante*, p. 191.

British West Africa—Gold Coast. **Hunter.**

Gold Coast. Report for 1899. Colonial Reports, Annual No. 306, 1900. Size 10 × 6, pp. 26. *Price* 2*d.*

The exports for 1899 show an increase of 12 per cent. over those for 1898, an improvement being recorded in the value of each of the principal items, palm oil, palm kernels, and rubber, especially the two former. The export of timber has, however, somewhat declined.

Cape Colony. *T. South African Philosoph. S.* **11** (1900): 125–160. **Juritz.**

The Chemical Composition of the Soils of the South-Western Districts of the Cape Colony. By Chas. F. Juritz. *With Diagrams.*

The results of these investigations show that the great want of most of the Cape soils, from an agricultural point of view, is phosphatic material, and next to this, lime.

Cape Colony—Glaciation. **Rogers and Schwarz.**

T.S. African Philosoph. S. **11** (1900): 113–120.

The Orange River Ground Moraine. By A. W. Rogers and E. H. L. Schwarz. *Plates. Also separate copy, presented by the Author.*

On a remarkable conglomerate in Prieska and Hope Town divisions, the rock surfaces beneath which give evidence that the country was in past ages traversed by land-ice.

Congo. *Mouvement G.* **17** (1900): 517–521. **[Wauters.]**

La source du Congo. *With Map.*

An argument in favour of the view that the Kuleshi is the real source of the Congo.

Congo basin. *Globus* **78** (1900): 304–305. **Singer.**

Zur Kenntnis des Kongo-quellengebietes. Von H. Singer.

On the results of the Lemaire Expedition in the Southern Congo basin.

French Congo—Likuala. *Mouvement G.* **17** (1900): 565–568. **Jobit.**

L'exploration de la Likuala aux Herbes. Par Capitaine E. Jobit.

On the journey alluded to in the *Journal* for January, p. 73.

Italian East Africa—Eritrea. **Melli.**

Tenente B. Melli. La Colonia Eritrea dalle sue origini fino al 1° Marzo 1899. Parma: L. Battei, 1899. Size 8 × 5½, pp. xviii. and 362. *Maps. Price* 2*s.*

A useful compilation on the history of Eritrea.

Madagascar. *B.S.G. Marseille* **24** (1900): 125–163. **Jully.**

Réception du général Galliéni, conférence de M. Jully sur Madagascar au point de vue économique.

North Africa. *G.Z.* **6** (1900): 611–626. **Kürchhoff.**

Das französische Kolonialreich in Nord-Afrika und die transsaharische Eisenbahn. Von Oberleutnant a. d. Kürchhoff.

A concise sketch of French political aims in North Africa.

Portuguese Colonies. *Questions Dipl. et Colon.* **10** (1900): 257–272. **Hauser.**

Études sur les colonies portugaises: Iles du cap vert, Guinée, Saô-Thomé. Par M. Henri Hauser.

Portuguese East Africa. **Robins.**

Mission Field **45** (1900): 307–309, 337–346, 388–394, 422–428.

Through Gorongoza and the Land of the Barue. By the Rev. W. H. Robins. *With Map and Illustrations.*

Notes of a journey made in 1899 in the country between the Pungwe and Zambezi, with return through Eastern Mashonaland.

Portuguese West Africa. **Sanders.**

K.A. Wetens. Amsterdam, P. Section Sci. **2** (1900): 398–406.

Determination of the latitude of Ambriz and of San Salvador (Portuguese West Africa). By C. Sanders.

By circummeridian altitudes of the sun as well as meridian altitudes of the sun and of α Crucis, taken with a sextant, the observer obtained, as a final result for the latitude of Ambriz, 7° 50′ S., as compared with 7° 52′ 9″ given on the Admiralty chart. Three meridian altitudes gave the latitude of San Salvador, at a point 1 kil. north of the centre of the town, as 6° 15′ 16″.

Sahara. *Naturw. Wochenschrift* **15** (1900): 517–520. **Werner.**

Aus dem Thierleben der Sahara. Von Dr. Franz Werner.

Seychelles. *M.G. Ges. Wien* **43** (1900): 163–180. **Zaffank.**

Die Seychellen. Von Josef Zaffank.

The author, an officer in the Austrian navy, after describing the Seychelles and their inhabitants, puts forward the theory that the group marks the site of the terrestrial paradise.

South-East Africa—Ophir. *Deutsche Rundschau* **23** (1900): 1–10. **Schiller-Tietz.**

Das wiederentdeckte Goldland "Ophir." Von Schiller-Tietz.

A historical sketch of the gold regions of South-East Africa, and their identification with the ancient Ophir.

Tropical Africa—Commerce. *Scottish G. Mag.* **16** (1900): 651–657. **Heawood.**

The Commercial Resources of Tropical Africa. By Edward Heawood, M.A.

NORTH AMERICA.

America—Historical. **De Roo.**

History of America before Columbus, according to Documents and Approved Authors. By P. De Roo. 2 vols. Vol. i. American Aborigines; Vol. ii. European Immigrants. Philadelphia and London: J. P. Lippincott Co., 1900. Size 9 × 6, pp. (vol. i.) l. and 614; (vol. ii.) xxiv. and 614. *Maps and Illustrations. Price 30s. net. Presented by the Publishers.*

The documents alluded to in the title of this work are principally those contained in the Vatican Archives, the examination of which first drew the writer's attention to the subject of the early history—especially the religious history—of America. From a subsequent study of published writings on the subject, Mr. de Roo was led to the conclusion that material exists for a much fuller knowledge of ancient America than is generally supposed. In the first volume he deals with the American aborigines, and is at much pains to prove that the rites observed in Mexico, etc., at the time of the conquest, point to a prehistoric knowledge of Christianity in those countries. Dismissing the idea that this may have been derived from China, he seeks in the second volume to show its European origin, holding that the legend of St. Brandan has a basis of fact, and that ancient Irish settlements existed in America before the arrival of the Scandinavians. A vast amount of information is brought together in the work, but few of the writer's conclusions can be accepted without reserve.

Mexico. *Globus* **78** (1900): 205–209. ——

Starrs Arbeiten über die Indianer des südlichen Mexiko. *With Illustrations.*

A review of two works by Prof. Starr of Chicago University, dealing with the Otomis and sixteen other tribes of Southern Mexico.

North America—Fur Trade. *Die Natur* **49** (1900): 555–558. **Notzke.**

Pelzjäger und Pelzjagd im amerikanischen Norden. Von G. C. Notzke.

North America—Plant Geography. *Science* **12** (1900): 830–842. **Kearney.**

Plant Geography of North America. III. The Lower Austral Element in the Flora of the Southern Appalachian Region. A preliminary note. By T. H. Kearney, Jr.

United States. *Petermanns M.* **46** (1900): 245–246. ——

Städte der Vereinigten Staaten mit mehr als 50,000 Einwohnern nach der Zählung im Juni 1900.

United States—Alaska. ——

Alaska. Coast Pilot Notes on the Fox Islands Passes, Unalaska Bay, Bering Sea, and Arctic Ocean as far as Point Barrow. Prepared by the Coast and Geodetic Survey, and Revised by Lieut. D. H. Jarvis. (Bulletin No. 40.) Washington, 1900. Size 11½ × 9½, pp. 60. *Plates. Presented by the Survey.*

United States—Arid Region. *National G. Mag.* **11** (1900): 438–442. **Newell.**

The limited Water Supply of the Arid Region. By Frederick H. Newell.

On irrigation schemes and possibilities in the Western United States.

United States—Census. *Petermanns M.* **46** (1900): 272. ——

Vorläufige Ergebnisse der Volkszählung in den Vereinigten Staaten im Juni 1900.

United States—Colorado. *J. Geology* **8** (1900): 647–654. **Lee.**

The Glacier of Mount Arapahoe, Colorado. By Willis T. Lee. *With Illustrations.*

Observations made during an ascent in August, 1900.

United States—Forestry. *G.Z.* **6** (1900): 626–634. **Hausrath.**

Wald und Waldschutz in den Vereinigten Staaten von Nord-Amerika. Von Prof. Dr. H. Hausrath.

Discusses the steps taken for forest-protection in the United States, and points out their insufficiency for the object in view.

United States—Louisiana. **Harris and Veatch.**

Part v.—Geology and Agriculture. A Preliminary Report on the Geology of Louisiana [1899]. By Gilbert D. Harris and A. C. Veatch. Made under direction of State Experiment Station, Baton Rouge, La. Size 9½ × 6½, pp. 354. *Maps and Illustrations. Presented by A. C. Veatch, Esq.*

Based on field-work commenced in 1898. The report opens with a historical review of geographical research in Louisiana.

United States—Texas. *National G. Mag.* **11** (1900): 442–445. **Greely.**

Hurricanes on the Coast of Texas. By General A. W. Greely.

On the hurricane of September 15–16, 1875.

CENTRAL AND SOUTH AMERICA.

Argentine Republic. **Cisneros and Garcia.**

Geografia Comercial de la América del Sur. Por Carlos B. Cisneros y Romulo E. Garcia. Segunda Entrega. Republica Argentina. Lima, 1897. Size 9 × 6½, pp. 100.

The absence of a table of contents or any clear subdivision much detracts from the usefulness of this work.

Bolivia. ——

Propuesta de Guillermo Arning y C^ia^ para la construccion de un ferrocarril de la Laguna Gaiba á Santa Cruz de la Sierra, etc. Buenos Aires, 1900. Size 11 × 7½, pp. 32. *Map.*

On railway projects for the opening up of the districts between the upper Mamore and the Paraguay.

Brazil—Ethnology. *Ymer* **20** (1900): 260–279. **Freyreiss.**

Bidrag till Kännedomen om Brasiliens urbefolkning. Skildringar från en resa i Minas Geraes 1814–1815 af G. W. Freyreiss. *With Map and Illustration.*

British Honduras. *B. American G.S.* **32** (1900): 331–333. **Avery.**

British Honduras. By W. L. Avery.

Chile—Atacama Desert. *Deutsche Rundschau G.* **23** (1900): 111–115. **Greger.**

Die Puna de Atacama. Von J. Greger. *With Map.*

Chile—Copper. *B.S.G. Com. Havre* **17** (1900): 111–126. ——

L'industrie du cuivre au Chili.

The progress of the copper industry in Chili is shown by the fact that the export of *ore* fell from 52,300 metric tons in 1876 to 21,900 in 1897.

AUSTRALASIA AND PACIFIC ISLANDS.

Fiji Islands. *J.R. Colonial I.* **32** (1900): 37–57. **Finucane.**

The Islands and the People of Fiji. By Morgan I. Finucane.

New South Wales—Gold. **Pittman.**
Records Geolog. Surv. New South Wales **7** (1900): 1–9.

The Auriferous Deposits of Lucknow. By E. F. Pittman. *With Plan.*

The mines at Lucknow are about 6 miles from Orange, on the Western railway.

New South Wales—Gold. **Pittman.**
Records Geolog. Surv. New South Wales **7** (1900): 9–15.

The Auriferous Ore-beds of the Lyndhurst Goldfield. By E. F. Pitmann. *With Illustrations.*

These deposits, situated on the Belubula river, 8 miles from Carcoar, are among the most remarkable in New South Wales.

Queensland—Brisbane River. *P.I. Civil Engineers* **142** (1900): 292–296. **Cullen.**

The Removal of the Lytton Rocks, Brisbane River. By E. A. Cullen. *Illustr.*

An account of the operations undertaken in 1896 for the improvement of the navigation of the Brisbane river. The total quantity of rock removed was 27,310 cubic yards, the channel formed being 300 feet wide, with a minimum depth of 20 feet.

Queensland—Brisbane River. *Queensland G.J.* **15** (1899-1900): 41-54. **Gregory.**
Mitigation of Floods in the Brisbane River. By the Hon. A. C. Gregory, C.M.G.

Queensland—Brisbane River. *Queensland G.J.* (1899-1900): 75-114. **Nelson and Oxley.**
Anniversary address to the Royal Geographical Society of Australasia, Queensland, 1900. By the Rt. Hon. Sir Hugh M. Nelson. *With Appendix and Map.*
On the early history of discovery of the Brisbane river, with transcript of the autograph journal kept by Lieut. Oxley in 1824.

Samoa. *National G. Mag.* **11** (1900): 417-426. **Morgan.**
The Samoan Islands. By Edwin V. Morgan.

South Australia—Yorke Peninsula. **Howchin.**
T.R.S. South Australia **24** (1900): 71-80.
Evidences of Extinct Glacial Action in Southern Yorke's Peninsula. By Walter Howchin.

Torres Strait. *Queensland G.J.* **15** (1899-1900): 25-40. **Douglas.**
The Islands and Inhabitants of Torres Strait. By the Hon. John Douglas, C.M.G.

Victoria. *P.I. Civil Engineers* **142** (1900): 326-333. **Gordon.**
Irrigation in Victoria. By George Gordon.
In spite of the seeming failure of irrigation undertakings in Victoria, the writer is sanguine of success, given an improvement in the present system of management.

Western Australia. *J.R. Colonial I.* **32** (1900): 10-36. **Smith.**
Recent Observations in Western Australia. By Lieut.-Colonel Sir Gerald Smith, K.C.M.G.

Western Australia—Year-Book. **Fraser.**
Western Australian Year-Book for 1898-99. (Eleventh Edition.) By Malcolm A. C. Fraser. Vol. ii. Perth, 1900. Size 8½ × 5½, pp. 370. *Illustrations. Presented by the Western Australian Government.*

POLAR REGIONS.

Arctic—Abruzzi Expedition. *Riv. G. Italiana* **7** (1900): 529-539. **Toni.**
Spedizione del Principe Luigi di Savoia Duca degli Abruzzi al Polo Nord, di Mons. G. Toni.

Arctic—Andrée's Expedition. *Ymer* **20** (1900): 303-324. **Nathorst.**
De hittills funna flytbojarne från Andrée-expeditionen. Af A. G. Nathorst. *With Map and Illustration.*
On the Andrée buoys so far discovered.

Arctic—Greenland. **Åkerblom.**
Positions géographiques déterminées par des observations astronomiques faites pendant l'expédition Suédoise au Grönland en 1899. Par Filip Åkerblom. (From 'Öfversigt af Kongl. Vetenskaps-Akademiens Förhandlingar 1900.' No. 6. Stockholm. Pp. 763-788.) Size 8½ × 5½. *Presented by the Author.*
Mr. Åkerblom accompanied Dr. Nathorst in the expedition of which the results are described in the January number of the *Journal*.

MATHEMATICAL GEOGRAPHY.

Cartography. *Ann. G.* **9** (1900): 291-312, 385-412. **Margerie and Raveneau.**
La cartographie à l'Exposition universelle de 1900. Par MM. Emmanuel de Margerie et Louis Raveneau.

Pendulum Observations. *C. Rd.* **131** (1900): 654-657. **Collet.**
Sur la correction topographique des observations pendulaires. Note de M. J. Collet.

Relief Maps. *B. American G.S.* **32** (1900): 367-380. **Mindeleff.**
Geographical Relief Maps: their use and manufacture. By Cosmos Mindeleff. *With Illustrations.*

Solution of Problems. **Minutilli.**
Prof. Federico Minutilli. Soluzione grafica di alcuni problemi di Geografia Matematica. Turin, etc.: G. B. Paravia & Co., [1900]. Size 10 × 7, pp. 60. *Diagrams. Presented by the Publishers.*
The problems dealt with include those relating to the form and size of the Earth, to

phenomena due to the motion of the Earth, and to the calendar. The graphic methods employed, although not presenting the minute accuracy of analytical methods, have the advantage of bringing the factors in the problems vividly before the eyes. A certain amount of spherical trigonometry is, of course, necessary for the solution of some of the problems.

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Bio-Geography. **Kirchhoff.**

Pflanzen- und Tierverbreitung. Von Alfred Kirchhoff. (Hann, Hochstetter, Pokorny, Allgemeine Erdkunde. Fünfte Auflage von J. Hann, Ed. Brückner und A. Kirchhoff. III. Abteilung.) Wien (etc.): F. Tempsky, 1899. Size 11½ × 8, pp. xii. and 328. *Maps and Illustrations. Price 9s.*

This is the concluding volume of the new edition of the 'Allgemeine Erdkunde,' of which the first volume appeared in 1896. The distribution of plants and animals is clearly dealt with, a preliminary section treating of the general principles of distribution and the relations which exist between the Earth and living organisms. Both as regards fauna and flora, Dr. Kirchhoff divides the world into a somewhat greater number of regions than is done by most writers.

Earthquake Observation. **Van der Stok.**

K. A. Wetens. Amsterdam, P. Section Sci. **2** (1900): 244–246.

Two earthquakes, registered in Europe and at Batavia. By Dr. J. P. van der Stok. *With Plate.*

The dates of the earthquakes in question were September 10, and 29–30, 1899.

Geormorphology. *Riv. G. Italiana* **7** (1900): 517–528. **Marinelli.**

Di alcuni scritti morfologici di Carlo Gemmellaro. Nota di Olinto Marinelli.

Continuation of the study noticed in the *Journal*, vol. xvi. p. 257. Gemmellaro was born in 1787.

Land Forms. **Gordon.**

The origin of Land-Forms through Crust-Torsion. By M. M. Ogilvie Gordon, D.SC., etc. (From the *Geographical Journal* for October, 1900.) Size 10 × 6½, pp. 14. *Illustrations.*

Limnology. **Forel.**

Handbuch der Seenkunde. Allgemeine Limnologie. Von Dr. F. A. Forel. (Bibliothek Geographischer Handbücher. Herausgegeben von Prof. Dr. Friedrich Ratzel.) Stuttgart: J. Engelhorn, 1901 [1900]. Size 8½ × 6, pp. x. and 250. *Price 7s.*

This is the latest issue of the useful series of geographical handbooks commenced a dozen years ago by the publication of Ratzel's 'Anthropogeographie.' The name of the author is a sufficient guarantee of the excellence of the work.

Meteorology. *C. Rd.* **131** (1900): 852–855. **Poincaré.**

Emploi de transparents pour combiner les effets de la révolution synodique avec ceux de la rotation terrestre. Note de M. A. Poincaré.

On a practical method of showing the combined effect of lunar and terrestrial motions on meteorological phenomena.

Meteorology—Hail Prevention. *C. Rd.* **131** (1900): 766–769. **Gastine and Vermorel.**

Sur les projectiles gazeux des canons proposés pour prévenir la formation de la grêle. Note de MM. G. Gastine et V. Vermorel.

Account of experiments to test the behaviour of gases discharged from cannons.

Meteorology—Instruments. *P.R.S.* **67** (1900): 3–58. **Chree.**

Investigations on Platinum Thermometry at Kew Observatory. By C. Chree, SC.D.

On experiments in platinum thermometry inaugurated at Kew in 1895. Improvements in apparatus, and further experiments, are said to be desirable.

Meteorology—International Meteorological Committee. ———

Report of the International Meteorological Committee, St. Petersburg, 1899. London: Eyre & Spottiswoode, 1900. Size 10 × 6½, pp. iv. and 110. *Price 2s. Presented by the Meteorological Office.*

Meteorology—Kite Observations. *Nature* **63** (1900): 109–111. **Frankenfield.**

The Kite Work of the United States Weather Bureau. By Dr. H. C. Frankenfield. *With Illustrations.*

Meteorology—Rainfall. *Nature* **63** (1900): 107–109, 128–133. **Lockyer.**

On Solar Changes of Temperature and Variations in Rainfall in the region surrounding the Indian Ocean. By Sir Norman Lockyer, K.C.B., and Dr. W. J. S. Lockyer. *With Diagrams.*

A study of much value in reference to the conditions which influence the recurrence of famine years in India and elsewhere.

Oceanography—North Sea. **Pettersson and Ekman.**

Bihang K. Svensk. Vetens.- A. Handlingar **25** II. (1900): (No. 1) 47.

Redogörelse för de svenska hydrografiska undersökningarne åren 1896–1899. V. Af O. Petterson och G. Ekman. [Summary in English.] *With Charts.*

Results of recent Swedish research in the North sea and neighbouring waters.

Oceanography—Pacific Ocean. **Lindenkohl.**

Problems of Physiography, concerning Salinity and Temperature of the Pacific Ocean. By A. Lindenkohl. (U.S. Coast and Geodetic Survey Report for 1897–1898. Appendix No. 9, pp. 467–473. *Diagrams.*) Washington, 1899.

Gives results of observations in the Bering and Okhotsk seas.

Oceanography—Salinity Determination. **Pettersson.**

Ann. Hydrographie **28** (1900): 500–504.

Ueber die Salzbestimmung im Meerwasser durch Titrirung. Von O. Pettersson.

Oceanography—Tides. **De Bruyn.**

K.A. Wetens. Amsterdam, P. Section Sci. **2** (1900): 189–196.

On the relation between the mean sea-level and the height of half-tide. By H. E. De Bruyn. *With Diagrams.*

A study of the causes which produce a variation in the difference between mean sea-level (the mean of heights observed at short intervals) and half-tide (the mean of high and low water), with a determination of its range at Delfzyl.

Physical Geography. **Brückner.**

Die feste Erdrinde und ihre Formen. Ein Abriss der allgemeinen Geologie und der Morphologie der Erdoberfläche. Von Eduard Brückner. (Hann, Hochstetter, Pokorny, Allgemeine Erdkunde. Fünfte Auflage von J. Hann, Ed. Brückner und A. Kirchhoff. II. Abteilung.) Wien (etc.): F. Tempsky, 1897. Size 11½ × 8, pp. xii. and 368. *Maps and Illustrations. Price* 7*s.*

Like the third volume of the same work, noticed above, this has been entirely rewritten by the present author, so as to give a comprehensive view of the general geology and morphology of the Earth's surface in the light of recent research.

Plant-distribution. *J. School G.* **4** (1900): 287–295. **Smith.**

Home Lore: Plant Associations and their Distribution. By Robert Smith, B.SC.

A very suggestive essay on the proper method of studying plant-life in its varying environments. The importance of vegetation in determining the general aspect of a country and moulding types of scenery is well shown. The premature death of the writer has already been alluded to in the *Journal*.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Historical—Alfred the Great. **Bowker.**

Alfred the Great, containing Chapters on his Life and Times, by Frederic Harrison, the Lord Bishop of Bristol, Professor Charles Oman, Sir Clements Markham, the Rev. Professor Earle, Sir Frederick Pollock, and the Rev. W. J. Loftie; also containing an Introduction by Sir Walter Besant, and a Poem by the Poet Laureate. Edited, with Preface, by Alfred Bowker. London: A. & C. Black, 1899. Size 8½ × 5½, pp. xii. and 260. *Map and Illustrations. Price* 5*s.*

A series of essays on King Alfred viewed in various characters. That by Sir Clements Markham treats of Alfred as a geographer, and points out the important services rendered by him to geographical science, both in the promotion of intercourse with distant lands, and through his literary labours.

Historical—Almanac. **Marcel.**

Sur un almanack xylographique à l'usage des marins bretons. Par Gabriel Marcel. (Extrait de la *Revue de Géographie*, Numéro d'Octobre.) Paris: C. Delagrave, 1900. Size 10 × 7, pp. 16. *Presented by the Author.*

On a wood-engraved almanac of the sixteenth century, containing small marine charts.

Historical—Elizabethan Voyages. **Payne.**

Voyages of the Elizabethan Seamen to America. Select Narratives from the 'Principal Navigations' of Hakluyt. Edited by Edward John Payne, M.A. First Series. Hawkins, Frobisher, Drake. Second Edition (1893, pp. lvi. and 272). Second Series. Gilbert Amadas and Barlow, Cavendish, Raleigh. Second Edition. Oxford: The Clarendon Press, 1900. Size 8 × 5¼, pp. l. and 298. *Portraits. Price each vol., 5s. Presented by the Publishers.*

Mr. Payne has done good service in supplying, in a form suitable to general readers, the narratives of the old Elizabethan voyages, as told by contemporary writers. The editorial matter is just sufficient to supply the necessary general grasp of the subject and elucidation of special points, without overweighting the books with extraneous details.

Historical—French Voyages. *Ymer* **13**, 1893 (1900): pp. 430. **Dahlgren.**

De franska sjöförderna till Söderhafvet i början af 18^e^ seklet. En studie i historisk geografi. Af E. W. Dahlgren. *With Maps.*

An elaborate study of the French voyages to the Pacific in the early part of the eighteenth century, well worthy of a translation.

Historical—Vespucci. *B.S.G. de l'Est* **21** (1900): 66–87. **Gallois.**

Américo Vespuce et les géographes de Saint-Dié. Par L. Gallois.

On the naming of America by Waldseemüller, and the circumstances which led to it.

History of Cartography. *Deutsche G. Blätter* **23** (1900): 161–229. **Ruge.**

Der Periplus Nordenskiöld's. Von Prof. Dr. S. Ruge.

A full summary of the chief contents of Nordenskiöld's great work.

History of Cartography. **Wagner.**

Der Ursprung der "Kleinen Seemeile" auf den mittelalterlichen Seekarten der Italiener. Von Hermann Wagner. (Aus den Nachrichten der K. Gesellschaft der Wissenschaften zu Göttingen. Philologisch-historische Klasse. 1900. Heft 3.) Size 9½ × 7, pp. 271–286.

See note, *ante*, p. 80.

BIOGRAPHY.

Abruzzi, Duke of. *Deutsche Rundschau G.* **23** (1900): 134–137. **Wolkenhauer.**

Prinz Ludwig Amadeus von Savoyen, Herzog der Abruzzen. Ein fürstlicher Nordpolfahrer. Von W. Wolkenhauer. *With Portrait.*

Alcock. **Michie.**

The Englishman in China during the Victorian Era, as illustrated in the Career of Sir Rutherford Alcock, K.C.B., D.C.L., many years Consul and Minister in China and Japan. By Alexander Michie. 2 vols. Edinburgh and London: W. Blackwood & Sons, 1900. Size 9 × 6, pp. (vol. i.) xiv. and 442; (vol. ii.) viii. and 510. *Portraits, Maps, and Illustrations. Price 38s. net. Presented by the Publishers.*

This work is not merely a biography of Sir Rutherford Alcock, although the deceased statesman occupies throughout the central position in the narrative. It acquires a special character from the fact that the writer was himself in great part a personal observer of the occurrences during the period dealt with, and is thus able to present a comprehensive view of the stages by which the present relation between China and foreign nations has been reached. Sir Rutherford's life was so interwoven with the history of the period, that his was the most fitting personality to form the centre round which the events could be grouped. The picture presented is that of a sterling, self-reliant character, characterized above all by devotion to duty and to the interests of his country and humanity at large.

Blanchet. *Ann. G.* **9** (1900): 456–457. **De la Blache.**

Paul Blanchet. Par P. Vidal de la Blache.

The regretted young French explorer first became known through his researches on the ancient Berber remains in Algeria.

Botella y Hornos. *B.S.G. Madrid* **42** (1900): 109–126. **Puig y Larraz.**

El Excmo. Sr. D. Federico de Botella y de Hornos. Necrologia. Por D. Gabriel Puig y Larraz.

Señor de Botella, honorary president of the Madrid Geographical Society from 1891 till his death in 1899, was the author of a large number of works and papers on physical geography.

Crampel. *B.S.G. Com. Bordeaux* **26** (1900): 443-445. **Labroue.**
Paul Crampel. Par E. Labroue.

Kingsley. *Deutsche Rundschau G.* **23** (1900): 137-138. ———
Miss Mary Kingsley. *With Portrait.*

GENERAL.

Australia and America—Exploration. *Riv. G. Italiana* **7** (1900): 501-516. **Porena.**
Le scoperte Geografiche del Secolo xix. del Prof. Filippo Porena. III. Scoperte nell' Australia e nelle Americhe.

Ballooning. *Globus* **78** (1900): 313-321. **Greim.**
Wissenschaftliche Luftfahrten. Von Dr. G. Greim. *Illustrations.*
Review of an important German work on the history and results, especially meteorological, of scientific ballooning.

Book of Reference. **Trübner**
Minerva. Jahrbuch der Gelehrten Welt. Herausgegeben von Dr. K. Trübner. Zehnter Jahrgang, 1900 and 1901. Strassburg: K. J. Trübner, 1901 [1900]. Size 6½ × 4½, pp. xxviii. and 1236. *Portrait. Price* 9*s.*
This indispensable work of reference has now reached its tenth yearly issue, which has been made still more complete than its predecessors. The geographically arranged list of learned bodies, whose staffs are given in the body of the work, fills 20 pages.

Colonization. *Questions Dipl. et Colon.* **10** (1900): 333-350. **Bernard.**
La main-d'œuvre aux colonies. Par M. A. Bernard.

Commercial Geography—Coffee. *Rev. Française* **25** (1900): 598-603. **Vasco.**
Le Café. Par M. G. Vasco. *With Map.*
Historical sketch of the development of coffee-cultivation. The map shows the principal producing countries.

Dock Book. ———
Dock Book. Fourth Edition, 1900. Containing dimensions of the principal Wet and Dry Docks, Patent Slips, etc., of the World. Also information on Ship Building and Engineering Works in Countries other than the United Kingdom. Compiled from various sources. London: J. D. Potter, 1900. Size 13½ × 8½, pp. 216. *Price* 10*s. Presented by the Hydrographer, Admiralty.*

French Colonies. **Arnaud and Méray.**
Exposition Universelle de 1900. Les Colonies Françaises. II. Organisation administrative, judiciare, politique et financière. Par A. Arnaud and H. Méray. Paris: A. Challamel, 1900. Size 9½ × 6, pp. 212. *Price* 3*s.* 9*d.*

——— **Guy**
——— ———. III. La mise en valeur de notre Domaine Colonial. Par Camille Guy. Paris: A. Challamel, 1900. Size 9½ × 6, pp. 648. *Price* 5*s.* 8*d.*

——— **Froidevaux and Tantet.**
——— ———. IV. L'Œuvre scolaire de la France aux Colonies. Par H. Froidevaux. Survivance de l'esprit français aux Colonies perdues. Par Victor Tantet. Paris: A. Challamel, 1900. Size 9½ × 6, pp. 356. *Price* 5*s.* 8*d.*

——— **Imbart de la Tour, Dorvault, and Lecomte.**
——— ———. V. Régime de la Propriété, Régime de la Main-d'œuvre, L'Agriculture aux Colonies. Par MM. Imbart de la Tour, Dorvault, Lecomte. Paris: A. Challamel, 1900. Size 9½ × 6, pp. 604. *Price* 5*s.* 8*d.*
A series of authoritative publications on the French colonies. For purposes of reference there is some drawback in the method of arrangement, the information on any one colony being widely scattered throughout the several volumes. There is, however, some compensation in the comprehensive view presented, in reference to the colonies as a whole, of the separate subjects treated of.

Geographical Education. *G. Anzeiger, Petermanns M.* **46** (1900): 130-132. **Haack.**
Hermann Wagners Denkschrift über die Lage des geographischen Unterrichts um die Jahrhundertwende. Von Dr. H. Haack.

Geographical Education. *Petermanns M.* **46** (1900): 242-245. ———
Der geographische Unterricht an den deutschen Hochschulen in Wintersemester 1900-1901.
Programme of geographical and allied lectures for thirty-six towns of Germany, Austria, and Switzerland.

Geographical Methods. *G.Z.* **6** (1900): 574–577. **Hettner.**

Neue Ausserungen über Wesen und Aufgaben der Geographie. Von Alfred Hettner.

A short review of recent contributions on geographical methodology.

Geographical Society of Paris. ——

Notice sur la Société de Géographie, fondée en 1821, reconnue d'utilité publique en 1827. Paris: Société de Géographie, 1900. Size 9 × 6, pp. 72. *Maps, Plans.*

Geography and Hygiene. **Steiner.**

Ueber die Bedeutung geographischer Kenntnisse für das Kriegs-Sanitätswesen. Von Dr. Johann Steiner. (Besonderer Abdruck aus der "Deutschen Militärärztlichen Zeitschrift," 1900.) Size 9½ × 6½, pp. [10]. *Presented by the Author.*

After insisting on the necessity of geographical knowledge on the part of those responsible for the health of troops on a campaign, the writer points out the particular geographical factors of most importance to military hygiene.

Geography of Disease. *Queensland G.J.* **15** (1899–1900): 19–24. **Hirschfeld.**

The Geographical and Climatic Factor in Pulmonary Consumption. By Dr. Eugen Hirschfeld.

Red Sea and Gulf of Aden—Pilot. ——

The Red Sea and Gulf of Aden Pilot, containing descriptions of the Suez Canal, the Gulfs of Suez and Akaba, the Red Sea and Strait of Bab-el-Mandeb, the Gulf of Aden, with Sokótra and adjacent Islands, and part of the Eastern Coast of Arabia. Fifth Edition, 1900. London: J. D. Potter, 1900. Size 9½ × 6, pp. xxvi. and 520. *Index Charts. Price 3s. 6d. Presented by the Hydrographer.*

The present edition, which supersedes the fourth, published in 1891, has been prepared by Captain John Phillips, R.N.

Science of Geography. **Richter.**

Die Grenzen der Geographie. Rede gehalten bei der Inauguration als Rector Magnificus der K. K. Karl-Franzens-Universität in Graz am 4. November 1899. Von Prof. Dr. Eduard Richter. Graz: Lenschner & Lubensky, 1899. Size 10 × 7, pp. 20.

Dr. Richter discusses the relations of geography to geology on the one hand, and history on the other.

NEW MAPS.

By E. A. REEVES, *Map Curator*, R.G.S.

EUROPE.

England and Wales. **Ordnance Survey.**

Ordnance Survey of England and Wales: Revised sheets published by the Director-General of the Ordnance Survey, Southampton, since December 8, 1900.

1-inch:—

ENGLAND AND WALES (revision):—122, 145, hills engraved in black or brown. **1s.** *each.*

6-inch—County Maps:—

ENGLAND AND WALES (revision):—**Cumberland,** 33 S.E., 35 S.W., 38 S.E., 40 S.E., 45 N.W., N.E., 46 N.E., 47 N.E., S.W., 48 N.E., S.E., 51 S.E., 53 N.W., S.E., 59 N.E., 61 N.W., 67 N.W., N.E., 74 N.E. **Denbighshire,** 4 N.W., 25 S.E., 29 N.E., 30 S.E., and 31 S.W., 31 N.W., S.E., 32 S.E., 33 N.W., 43 N.W., 45 N.E., 46 N.W. **Derbyshire,** 43 N.W., 44 N.W., N.E. **Glamorganshire,** 18 N.W., 27 N.W., 30 N.W., 34 S.E., 36 N.W., S.W., S.E., 45 N.W., 49 S.E., 50 N.W., S.W. **Northamptonshire,** 28 S.E., 29 S.W., 30 N.W., S.E., 37 N.W., 38 N.W., 43 N.E., S.W., 49 S.E., 50 S.E., 51 S.W., S.E., 54 N.E., 55 N.W., S.E., 58 S.E., 59 N.W., 62 N.E. **Nottinghamshire,** 11 N.W., 26 S.W., 33 N.W., N.E., 35 S.W., 40 N.E. **Staffordshire,** 6 N.E., 10 S.E., 20 S.W. **Wiltshire,** 3 S.E., 4 S.W., 7 S.E., 8 N.E., S.W., 9 N.W., N.E., S.E., 10 S.W., 12 N.E., 13 N.W., S.E., S.W., 14 S.W., 16 N.W., S.W., 19 N.W., N.E., S.W., S.E., 21 N.W., N.E., S.W., 22 S.E., 23 complete, 36 S.W. **1s.** *each.*

25-inch—Parish Maps:—

ENGLAND AND WALES (revised):—**Carnarvonshire,** XIV. 13; XVI. 4, 10; XIX. 13; XX. 12; XXI. 9; XXV. 12, 16; XXVI. 12; XXVII. 8, 13, 16; XXVIII. 5,

10; XXXI. 8, 14, 16; XXXII. 9, 11, 16; XXXIII. 13, 14, 15; XXXIV. 5, 11, 14, 15; XXXV. 1; XXXVIII. 12, 15; XXXIX. 1, 2, 9, 13, 14, 16; XL. 1, 2, 3, 4, 5, 6, 9, 11, 12, 15; XLI. 1, 2, 5, 9; XLII. 2, 3, 4; XLIII. 3; XLIV. 11; XLV. 6; XLVI. 4. **Cumberland**, XIV. 4, 7, 8, 10, 11, 14, 15, 16; XV. 5, 16; XVIII. 4, 9, 14, 16; XX. 8, 12, 15; XXI. 3, 4, 7, 8, 9, 10, 11, 12, 13, 14; XXII. 7, 8, 10, 13, 15, 16; XXIII. 13, 14; XXV. 1, 2, 5, 9; XXVIII. 1, 4; XXIX. 4, 5, 6; XXX. 1, 2, 3, 4; XXXI. 2. **Derbyshire**, XLV. 1, 5; XLVI. 10; L. 1, 2, 4, 5, 8; LI. 1, 4, 5, 9, 13; LVI. 7. **Glamorganshire**, VI. 14; XII. 2, 5, 9, 10, 15, 16; XVIII. 1; XIX. 4, 8, 12; XXIX. 5, 13, 15; XXXVII. 3, 8, 12, 16; XLIII. 4; XLIIIA. 9; XLVII. 6; L. 4. **Merionethshire**, XI. 1; XVIII. 4. **Monmouthshire**, XXVII. 5, 13; XXXII. 16; XXXVII. 4; XXXVIII. 9. **Northamptonshire**, VI. 4, 5, 9, 12, 13; VII. 13, 15; X. 10, 13, 14, 15, 16; XI. 4, 6, 9, 13, 14, 15, 16; XII. 1, 3, 12, 13, 14, 15, 16; XIII. 3, 7, 10, 13, 14; XV. 8, 13, 16; XVI. 1, 5, 6, 15; XVII. 1, 3, 4, 6, 8, 10, 11, 14; XVIII. 2, 3, 5, 6, 7, 8, 9, 11, 12, 13, 14, 15, 16; XIX. 1, 3, 4, 6, 8, 9, 10, 11, 12, 13, 14, 15; XX. 5, 9; XXIV. 4; XXV. 7, 10, 11, 14; XXVI. 4, 13, 15; XXVII. 3, 4, 11; XXXII. 7; XXXIII. 11; XXXIV. 1; XLIV. 4. **Nottinghamshire**, XXXII. 12; XXXVII. 4, 8, 10, 11, 15; XXXVIII. 5, 16; XXXIX. 9; XLI. 4, 7, 8, 11, 14, 15; XLIII. 5; XLV. 7; XLVI. 3, 4. **Wiltshire**, XV. 8; XX. 14; XXVI. 13; XXXIII. 14, 15, 16; XXXIV. 10, 13, 14; XXXV. 13; XXXIX. 10; XL. 2, 12, 13, 16; XLI. 2, 4, 5, 6, 13, 14, 15; XLV. 7, 8, 12, 15; XLVI. 3, 4, 7, 8, 9, 10, 11, 13, 14; XLVII. 1, 2, 3, 6, 7, 10, 11, 12, 16; XLVIII. 2, 9, 10, 11, 15, 16; LII. 2, 7, 11; LIII. 1, 3, 10. *3s. each.*

(*E. Stanford, London Agent.*)

Germany. **Konigl. Preuss. Landes-Aufnahme.**

Karte des Deutschen Reiches. Scale 1: 100,000 or 1·6 stat. mile to an inch. Sheets: 231, Haren; 256, Lingen; 282, Rheine; 311, Hildesheim; 358, Brakel. Herausgegeben von der Kartogr. Abtheilung der Konigl. Preuss. Landes-Aufnahme. *Price* 1.50 *mark each sheet.*

Sweden. **Swedish General Staff.**

Generalstabens Karta öfver Sverige. Scale 1: 100,000 or 1·6 stat. mile to an inch. Sheets: 79, Eda; 97, Falun; 98, Gefle.—Karta öfver Norbottens Län. Scale 1: 200,000 or 3·2 stat. miles to an inch. Sheets: 39, Jadnem; 40, Dikanäs; 44, Piteä; 48, Vilhelmina. Generalstabens topografiska afdelning, Stockholm. *Presented by the Topographical Section of the Swedish General Staff.*

ASIA.

Central Asia. **Sven Hedin.**

Karte des Tarim-Beckens und des Kwen-lun-Gebirgssystems. Hauptsächlich nach den Forschungen von Dr. Sven Hedin in den Jahren 1894–96 und mit Benutzung aller vorhandenen Quellen entworfen und gezeichnet von Dr. Br. Hassenstein. Scale 1: 1,000,000 or 15·8 stat. miles to an inch. Nebenkarten: Bl. i. Route von Kok-Rabat über Jarkent nach Kargalik, 1: 500,000 or 7·8 stat. miles to an inch. Die Oasen des Masar-tag, 1: 500,000. Die Oase Khotan, nach Dutreuil de Rhins, 1: 500,000. Bl. ii. Die Oase Kerija, 1: 500,000. Bl. iii. Reiseroute von Kum-tjekke nach dem Lop-nor, 1: 750,000 or 10·2 stat. miles to an inch, Taf. 1–3.—Karte des mittleren und östlichen Kwen-lun zur Darstellung von Dr. Sven Hedins Routenaufnahmen im Hochland des nördlichen Tibet, Tsajdam und dem Kuku-nor-Gebiet 1896 und 1897 bearbeitet und gezeichnet von Dr. Br. Hassenstein. Scale 1: 1,000,000 or 15·8 stat. miles to an inch, Taf. 4–5. —Dr. Sven Hedins Reiseroute durch Kan-su, Ala-schan und Ordos, 1896 und 1897. Nach dem Tagebuch entworfen und gezeichnet von Dr. Br. Hassenstein, 1: 1,000,000. Nebenkarte: Uebersicht von Dr. Sven Hedins Reiseroute von Kuku-nor bis Peking, 12. November 1896 bis 2. März 1897, 1: 7,500,000 or 118 stat. miles to an inch, Taf. 6. Petermanns Geographische Mitteilungen. Ergänzungsheft No. 131. Gotha: J. Perthes, 1900. *Presented by the Publishers.*

These six sheets of maps accompany the scientific report on Dr. Sven Hedin's explorations in Central Asia between the years 1894 and 1897. They have been compiled by Dr. B. Hassenstein from the explorer's notebooks and surveys, combined with the work of other travellers, a list of whom is given, together with the dates of their journeys. It is to be regretted that the results of Captain H. H. P. Deasy's surveys in the region of the upper Yarkand valley could not be utilized, but the map showing these did not appear until just after Dr. Sven Hedin's maps were published. Dr. Sven Hedin has added considerably to our knowledge of the geography of Central Asia, and these maps, and the text they accompany, testify to his perseverance, industry, and skill.

China. **Anz.**

Routenaufnahme zwischen Tschifu und Kiautschou. Ausgeführt im März 1899 und gezeichnet von Walther Anz. Scale 1 : 500,000 or 7·8 stat. miles to an inch. Petermanns Geographische Mitteilungen Jahrgang 1900, Taf. 23. Gotha: J. Perthes, 1900. *Presented by the Publishers.*

Indian Government Surveys. **Surveyor-General of India.**

Indian Atlas, 4 miles to an inch. Sheets: 77 N.E., parts of districts Nellore and Kadapá (Madras Presidency), 1899; 44, parts of districts Malabar and South Kanara (Madras) and of Coorg, 1899.—Upper Burma Survey, 1 inch to a mile. Sheets: 175 (preliminary edition), district Minbu, Seasons 1892-93, 1900. 304 (preliminary edition), part of Ruby Mines district and Northern Shan States, Seasons 1890-93 and 1896-97. 1899. 402 (preliminary edition), Southern Shan States, Season 1897-98. 1899. 405, Southern Shan States, Season 1897-98. 1900 406 (preliminary edition), Southern Shan States, Season 1897-98. 1900.—Bombay Survey, 1 inch to a mile. Sheets: 164, district Thana, Season 1880-81. 1900. 206, parts of Ratnagiri district and Kolhapur and Bavda States, Season 1892-93, 1900.—Central India and Rajputana Survey, 1 inch to a mile. Sheets: 274, parts of Gwalior, Indore, and Dewás (C.I. Agency), Season 1877-78. 1900. 282, parts of districts Khándesh (Bombay Presidency), Nimar (Central Provinces), and Native State of Holkar (C.I. Agency), Season 1874-75. 1900.—Sind Survey, 1 inch to a mile. Sheets: 47, district Hyderabad, Seasons 1893-94 and 1896-97. 1900.—68, districts Hyderabad and Thar and Párkar, Seasons 1893-94 and 1897-98. 1900.—India, to illustrate Gauges of Railways, 80 miles to an inch, 1900.—Assam, index map showing scales of survey. 1900.—Assam, index map showing scales of publication. 1900.—District Jhelum, Punjab, 8 miles to an inch. 1900.—Map of portions of Western China and Tibet, explored by Captain H. H. P. Deasy in 1897-98-99, 8 miles to an inch, 5 sheets.—Alwar State, Rajputana. 1900.—Nos. 6 and 7, preliminary Charts of the Principal Triangulation of the Manipur Longitudinal Series, Seasons 1894-96 and 1898-99. 4 miles to an inch. 1900. *Presented by H.M. Secretary of State for India, through the India Office.*

Manchuria. **'Pravitelstvenny Vestnik.'**

Map of Manchuria, showing railways, telegraph lines, etc. Scale 1 : 3,275,712 or 51·7 stat. miles to an inch. Issued with the 'Pravitelstvenny Vestnik.' St. Petersburg: A. Ilyin.

A rough outline map of Manchuria, in Russian, prepared specially to show means of communication, including railways constructed and proposed, and telegraph lines. It is issued with the 'Pravitelstvenny Vestnik,' an official publication.

AFRICA.

Congo Free State. **Wauters.**

Carte de l'État Indépendant du Congo. Scale 1 : 2,000,000 or 31·4 stat. miles to an inch. Dressée par A. J. Wauters, Rédacteur en chef du "Mouvement Géographique." L. Monduau, Bruxelles, 1900. 4 sheets. *Presented by the Author.*

This is a new edition of M. Wauters' map of the Congo Free State and parts of adjacent territories, which was first published in sections in the *Mouvement Géographique* in 1897 and 1898. Although the map is corrected to October, 1900, in some respects it is not quite up to date, as since then the results of several important expeditions have been made known; but these will doubtless be embodied in another edition. It is printed in colours, and a great deal of information is given.

German East Africa. **Sprigade.**

Karte von Deutsch-Ostafrika. Scale 1 : 300,000 or 2·7 stat. miles to an inch. Sheet E6, Mohóro. Von P. Sprigade. Berlin: D. Reimer (Ernst Vohsen), 1900.

The alteration in the style of production of this map, as exemplified by the present sheet, does not appear to be an improvement. Hitherto the system of horizontal lines representing the relief has been combined with brown shading, but now line-work only is employed, which in some places is not very distinct, whilst the lettering in certain instances is smaller and somewhat lacking in clearness. Travellers' routes are shown together with the dates of their journeys, and notes are given descriptive of the character of the country.

Morocco. **Fischer.**

Reisewege im Atlas-Vorlande von Marokko. Scale 1 : 300,000 or 4·7 stat. miles to an inch. Aufgenommen und gezeichnet von Professor Dr. Theobald Fischer

im Frühjahr 1899. Petermann's 'Geographische Mitteilungen.' Erganzungsheft, No. 133, Taf. 2, 3 u. 4. Gotha: J Perthes, 1900. *Presented by the Publishers.*

Dr. Fischer's route, laid down on these three sheets, extends from Mogador, eastward to the city of Morocco, and thence northward to Casablanca; after this it again turns inland, and passes in an easterly direction to Fez. Altitudes are given, together with notes descriptive of the character of the country traversed. The map accompanies a scientific report on the expedition, which, among other information, gives an account of the manner in which the route survey was conducted.

North-East Africa. **Michel and Hansen.**

Mission de Bonchamps de Djibuti au Nil Blanc à travers l'Éthiopie Méridionale et les Pays Gallas. Scale 1: 200,000 or 3·1 stat. miles to an inch. D'après les travaux de MM. L. Bartholin, Ch. Michel, Faivre et M. Potter. Dressé par Ch. Michel, second de la Mission 1897–98. Dessiné par J. Hansen. Service Géographique des Colonies. Paris: Henry Barrère. 15 sheets. *Price* 20 *francs. Presented by M. Ch. Michel.*

The results of the explorations and surveys of the members of the Bonchamps Expedition, from Jibuti on the Red sea, through Southern Abyssinia to the Sobat and Nile, are shown on this map, which consists altogether of fourteen sheets and an index folded in a portfolio. The scale of the map is 1: 200,000, or just over 3 stat. miles to an inch, which is sufficiently large to admit of a considerable amount of detail being shown; and although little attempt has been made to incorporate the work of other explorers, and a few miles from the line of route the map is a blank, yet near the line traversed by the expedition a good deal of information is given, including altitudes and notes on the character of the country. No description appears on the map of the manner in which the survey was made, the instruments employed, the relative value of certain parts of the work, the reliance to be placed upon the positions assigned to various places, nor how the altitudes have been obtained, which is to be regretted. It, however, appears to be in the main an ordinary route-survey, adjusted to certain astronomically determined positions, that for Addis Abeba agreeing in latitude and longitude with the results of observations made by Captain Germain and Sub-Lieut. Dyé, of Commandant Marchand's expedition in 1899.

Although somewhat roughly lithographed, the style of the work is fairly clear. No colouring has been employed, and the hill-work is shown by black horizontal lines.

West Africa. **Wallach.**

Map of the Gold Coast, with part of Ashanti, showing the positions and areas of mining properties. By Henry Wallach, F.R.G.S. Scale 1: 253,440 or 4 stat. miles to an inch. London: E. Stanford, 1900. 4 sheets. *Price* £1 1*s. Presented by the Author.*

This map extends from 7° N. lat. to the coast, and from long. 0° 30′ E. to 3° 10′ W. It has been especially constructed by Mr. Wallach to show the positions and areas of mining properties, which are named and tinted red; but, in addition to this, the map will be useful for general reference, as it contains a good deal of useful information, and shows divisional boundaries, railways, and telegraphs. The lower course of the Volta to the sea is given as an inset on the same scale as the principal map.

GENERAL.

World. **Schrader.**

L'Année Cartographique. Supplément annuel a toutes les publications de Géographie et de Cartographie. Dressé et rédigé sous la direction de F. Schrader. Dixième Supplément. Contenant les Modifications Geographiques et Politiques de l'Anée 1899. Trois feuilles de cartes avec texte explicatif au dos. Paris: Librairie Hachette et Cie., 1901. *Price* 3 *fr.*

Although the title on the cover of this tenth issue of the 'Année Cartographique' states that it contains "les modifications geographiques et politiques de l'année 1899," this is misleading, for in the present case M. Schrader has devoted his publication to a very interesting review of the geographical work of the world during the nineteenth century. On three sheets he gives two maps of the continents, on the same scale and facing each other, upon which he shows, by a system of brown tinting, the state of our geographical knowledge at the commencement and close of the century. The extent of our information concerning various regions is indicated by the intensity of the colouring, the darkest representing parts that have been thoroughly surveyed, a lighter shade those regions that are approximately mapped, a somewhat lighter shade still those parts concerning which only rough route-surveys exist, whilst regions that are totally unexplored are left white. By comparing the two maps of any continent, the

progress made in discovery and exploration during the century is in this way clearly brought out; although perhaps a more graphic and natural effect would have been produced by reversing the order of the shades, and showing regions concerning which we have the best information as white, and those of which we are still in ignorance as dark. There are altogether three sheets, of which the first deals with Asia and Australia, the second with Africa, and the third with North and South America. The maps, although of a very general character, have been carefully prepared, and contain on their backs notes giving a summary of the principal explorations and surveys of the century.

World. **Vivien de St. Martin and Schrader.**

Atlas Universel de Géographie. Commencé par M. Vivien de St. Martin et continué par Fr. Schrader. Sheet 44, Asie politique. Paris: Librairie Hachette et Cie. *Price 2 fr. Presented by the Publishers.*

Like all others belonging to this atlas, this general political map of Asia has been most carefully drawn and engraved. It shows a deal of information for a map on so small a scale, and yet has not the appearance of being overcrowded. Political boundaries are indicated in colour.

United States Charts. **U.S. Hydrographic Office.**

Pilot Charts of the North Atlantic Ocean for December, 1900, and of the North Pacific Ocean for January, 1901. U.S. Hydrographic Office, Washington, D.C. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

ORDNANCE SURVEY MAPS.

THE following is a list of the various Ordnance Survey Maps of the British Isles on sale to the public, together with the prices. E. Stanford, 12, 13 and 14, Long Acre, W.C., is the London agent; there are also provincial agents in most of the important towns of England, Scotland, and Ireland. In places where no agent exists, the maps can be obtained through the principal local post offices.

1-inch Scale.

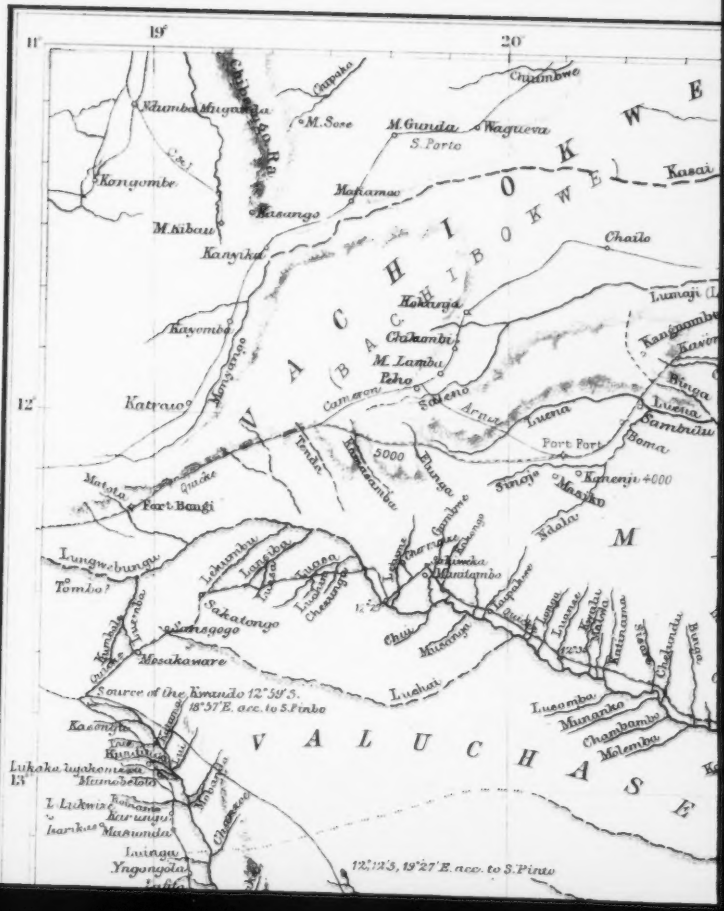
	Price per sheet.
1. England and Wales, old series, in black, with outline and hill hachures.	
Size 36 × 24	2 6
Size 18 × 12	1 0
2. Ditto, outline, contours in black, latitude and longitude marked. Size 18 × 12 inches. On paper	1 0
3.*Ditto, hills hachured in brown, latitude and longitude marked. Size 18 × 12 inches. On paper	1 0
4.*Ditto, hills hachured in black, latitude and longitude marked. Size 18 × 12 inches. On paper	1 0
5.*Ditto, hills hachured in brown, contours red, roads brown, water blue, magnetic variation shown, latitude and longitude not marked. Size	

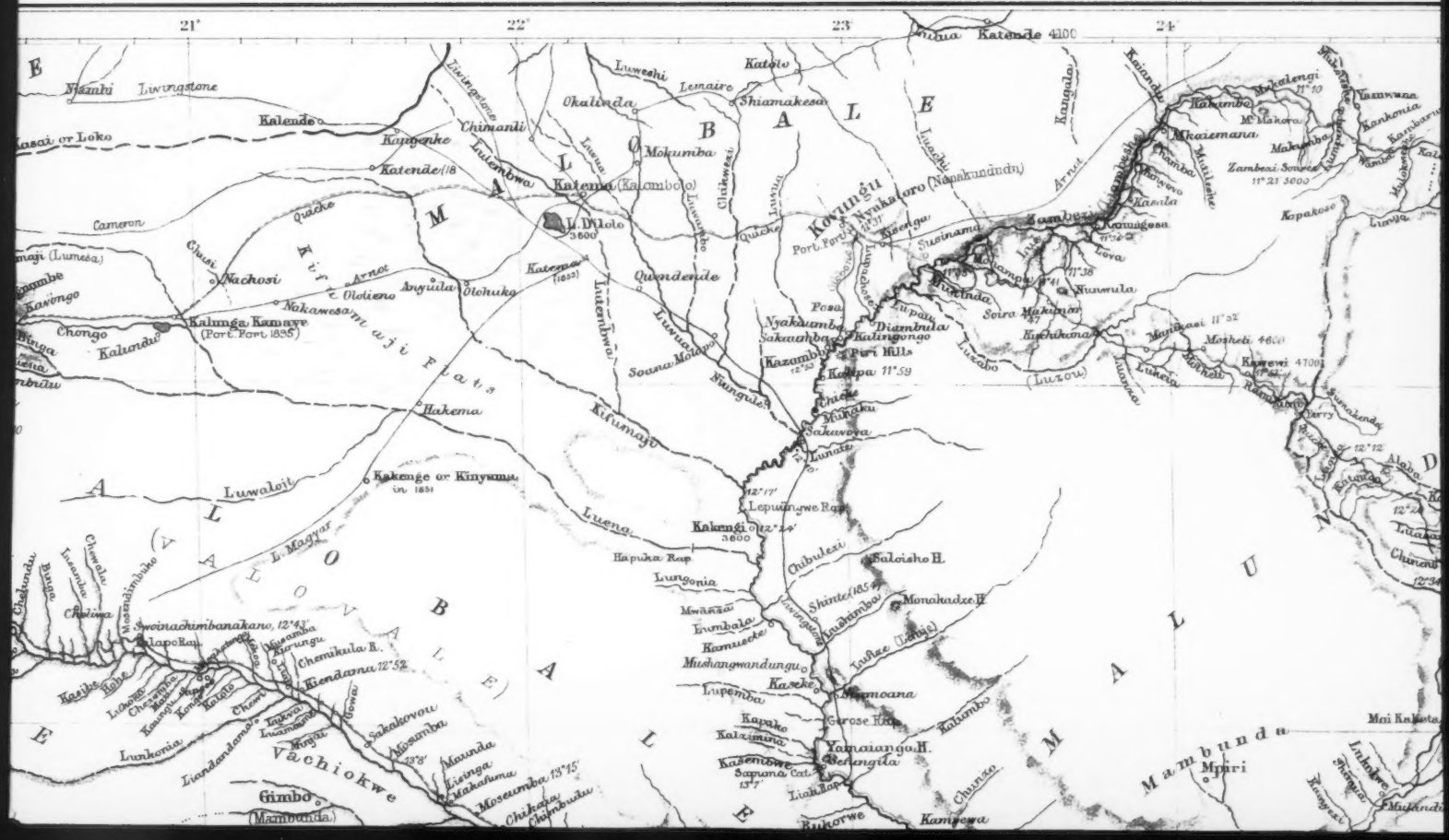
* Publication in progress.

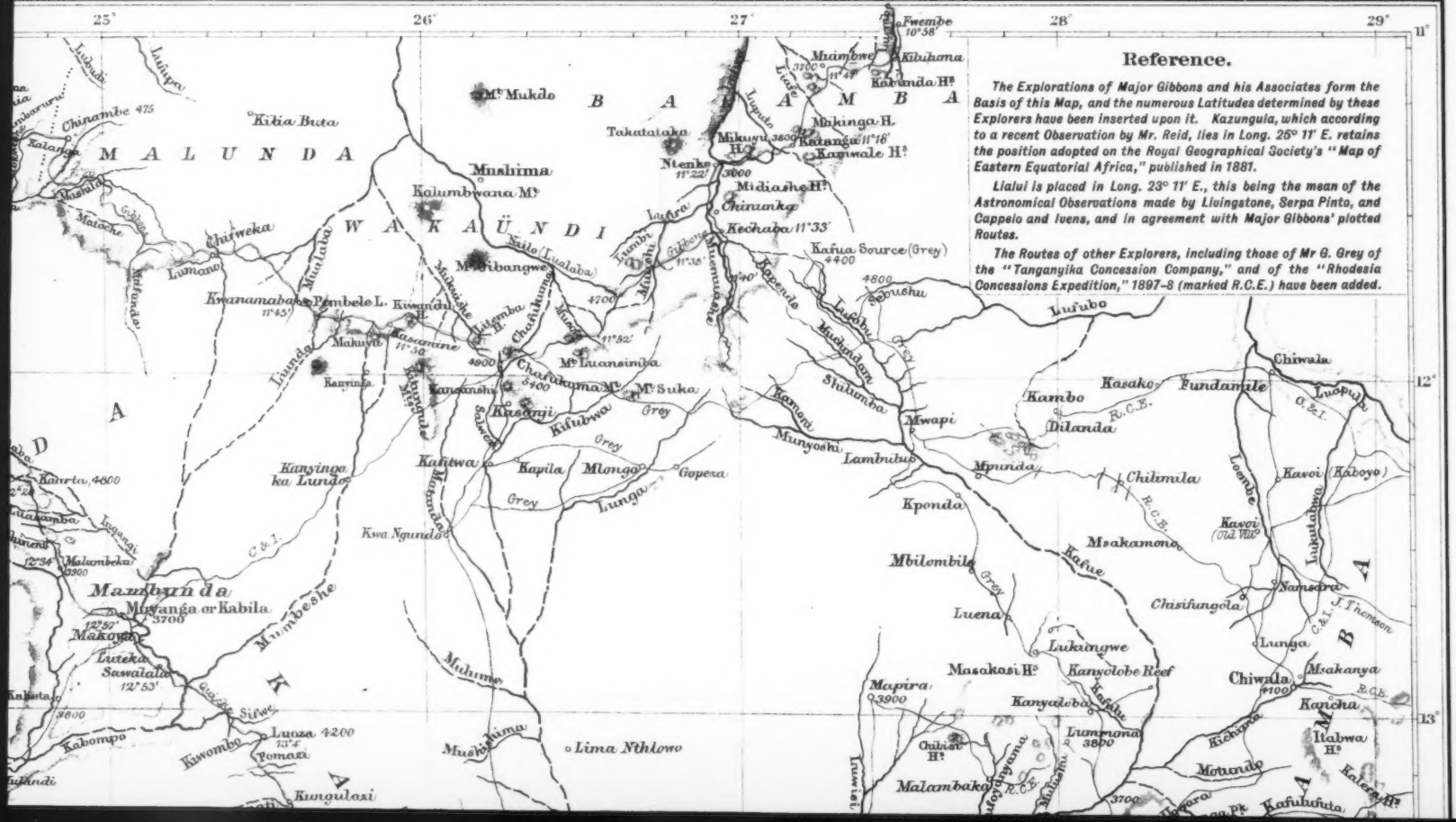
	Price per sheet.
18 × 12 inches. On linen-backed paper, either flat (with a few exceptions) or folded in covers. Single sheets	1 0
Combined sheets	1 6
6. Scotland, outline and contours in black, latitude and longitude marked. Size 24 × 18 inches. On paper	1 9
7.*Ditto, hills hachured in brown, and black contours, latitude and longitude marked. Size 24 × 18 inches. On paper	1 6
8. Ireland, outline, not contoured, in black, latitude and longitude marked. Size 18 × 12 inches. On paper	1 0
9. Ditto, hills hachured in black, latitude and longitude marked. Size 18 × 12 inches. On paper	1 0
10.*Combined maps of areas round certain large towns, or other areas, such as the New Forest and Lake District, and published in various forms and sizes. These maps usually show outline and contour in black and roads in brown. In sheets, unmounted — 9*d.* to	1 0
Folded in cover — 1*s.* to	1 6
4 Miles to an Inch.	
11.*England and Wales, engraved in black, latitude and longitude marked, no hill shading or contours. Size 22½ × 15 inches. On paper	1 6
12.*County maps, cheap edition, roads in brown, latitude and longitude marked, on thin paper or folded in covers. Kent, size 22½ × 17 inches. Northumberland and Durham (combined), size 17⅜ × 23⅜ inches. In sheets, unmounted	0 6
Folded in covers	0 9
6-Inch Scale.	
13. Great Britain, water coloured blue or black lined, contours in black, latitude and longitude marked. Heliozincographed and photozincographed. Size 18 × 12 inches	1 0
Engraved or photozincographed (where not published in quarter sheets). Size 36 × 24 inches	2 6
14. Ireland, engraved or heliozincographed, contours in black, latitude and longitude not marked. Size 36 × 24 inches	2 6
$\frac{1}{2500}$ Scale.	
15. Houses ruled in black, water blue or black lined, latitude and longitude not marked. Size 38 × 25½ inches	3 0
16. Houses red, water blue, roads brown, latitude and longitude not marked. Unrevised editions only coloured in this form. Size 38 × 25½ inches. From 2*s.* 6*d.* to 23*s.*, according to the amount of colouring. This form is gradually being superseded by 15.	
Town Scales.	
17. $\frac{1}{500}$ scale, houses stippled. Size 38 × 25½	2 6
18. Ditto, houses ruled. Size 38 × 25½	2 6
19. Ditto, houses red, water blue, roads brown. Size 38 × 25½ inches. From 2*s.* 6*d.* to 15*s.*, according to the amount of colouring. Applies to unrevised only.	
20. 5-feet scale, houses stippled. Revised. Size 36 × 24 inches	2 6
Index Maps.	
21. Indexes to the sheets of the 1-inch scale maps of England and Wales, Scotland, and Ireland, scale 30 miles to an inch. Sizes about 18 × 13 inches	0 2
22.*Index to the sheets of the 6-inch scale map, parishes coloured. England and Wales. Size 18 × 12 inches	1 0
Scotland. Size 24 × 18 inches	1 9
23.*Index to the sheets of the 1 : 2500 scale map, parishes coloured. England and Wales. Size 18 × 12 inches	1 0
Scotland. Size 24 × 18 inches	1 9
Nos. 22 and 23 are identical with Nos. 2 and 6, but with sheet lines added, printed on thin paper, and coloured to show civil parishes.	

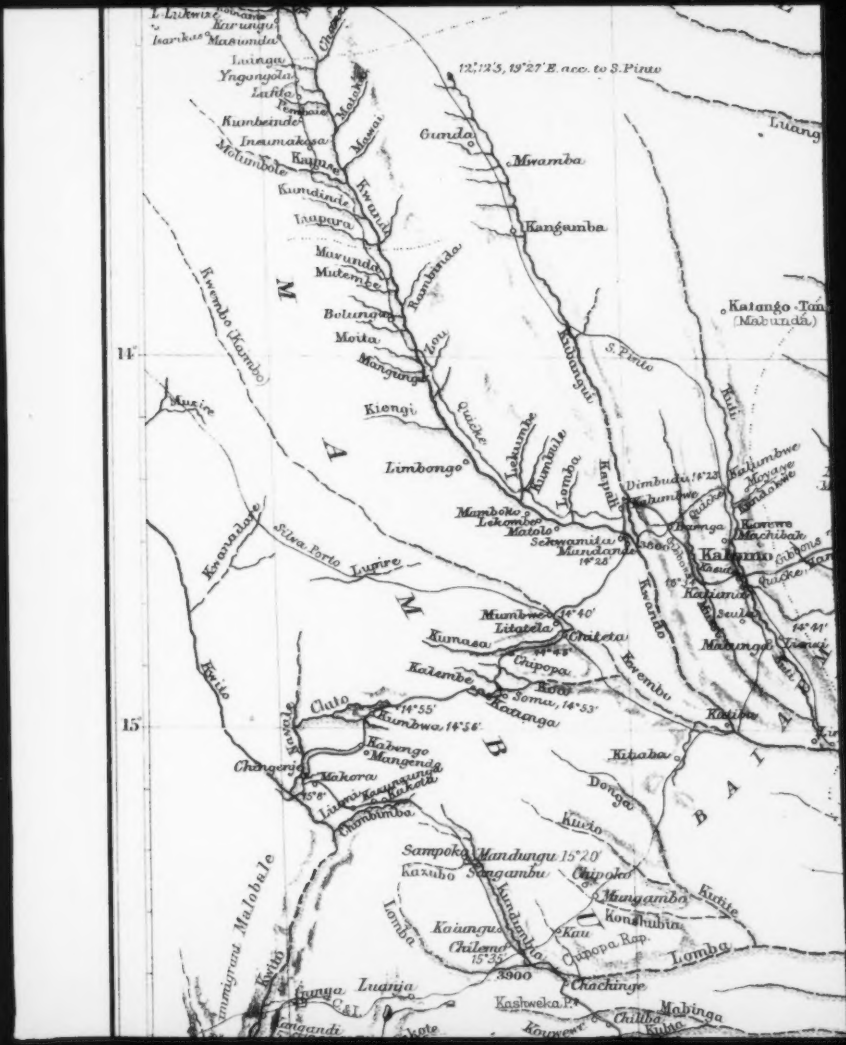
* Publication in progress.

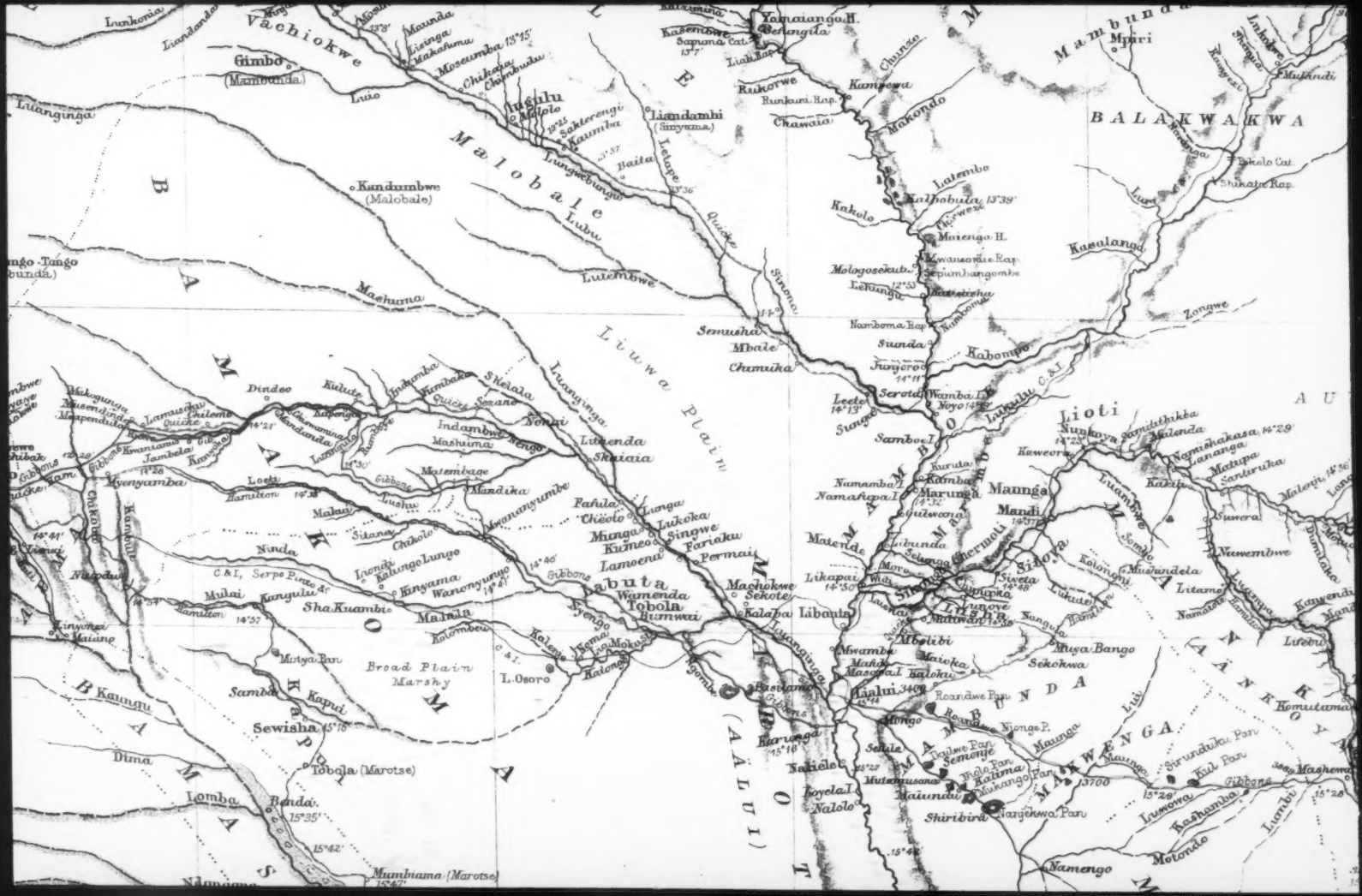
Price per sheet.
1 0
1 6
1 9
1 6
1 0
1 0
1 0
1 6
1 6
0 6
0 9
1 0
2 6
2 6
3 0
2 6
2 6
2 6
0 2
1 0
1 9
1 0
1 9

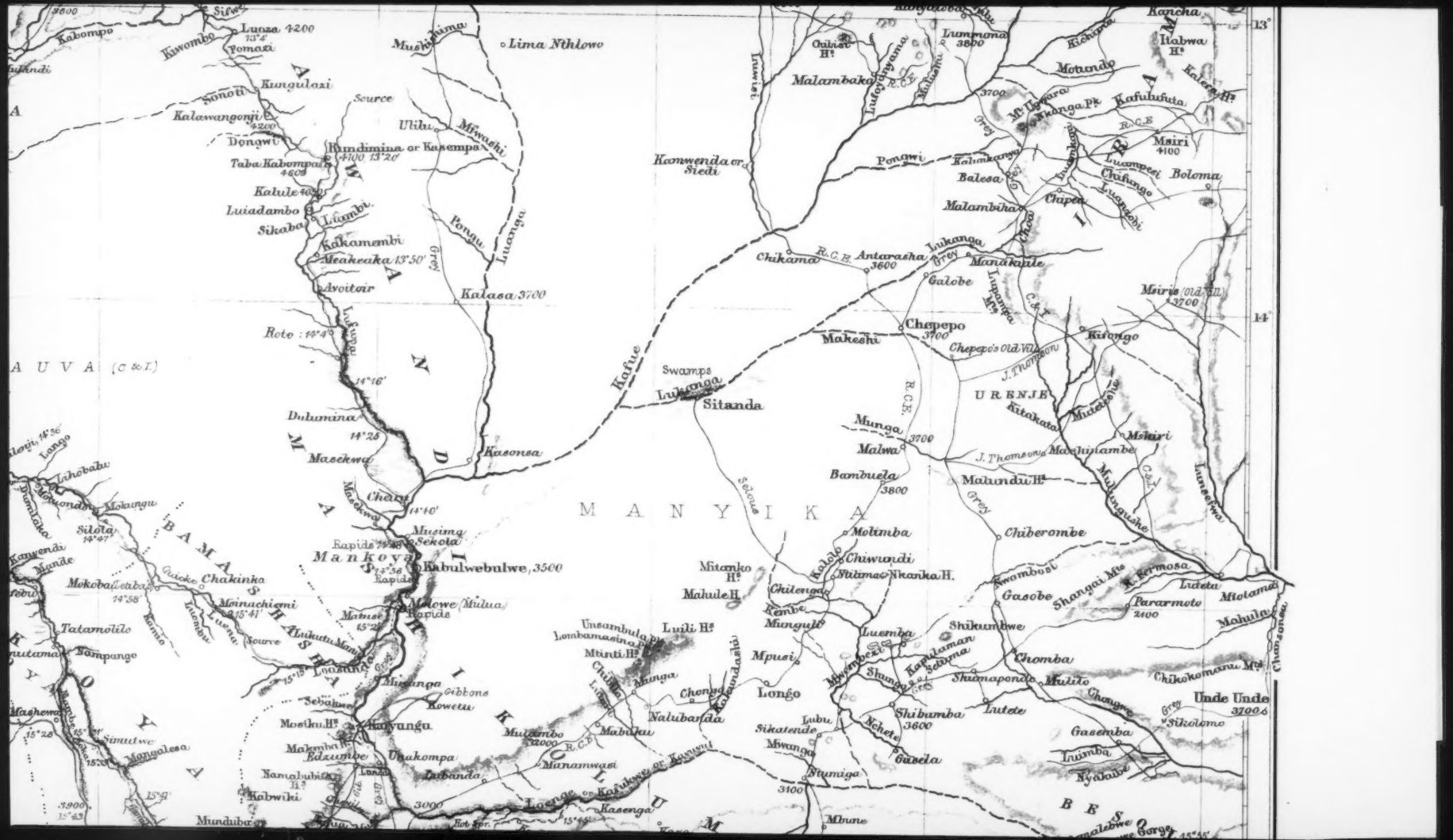

18°
19°
20°
12°
13°
Chibia Ao Re
Caipuka
Chiumbwe
Ndumba Mugalla
M. Sore
M. Gunda
Wagueva
S. Porto
Kasai
Kanyombe
Makamac
Kasango
M. Kibau
Kanyika
Chailo
Kakanja
Lunaji
Kayombo
Chakambi
M. Lambu
Peho
Katrayo
Camacau
Kasseio
Arua
Luena
Port Port
Bloma
Tenda
5000
Tunga
Sinoje
Kenenji 4000
Masiko
Matota
Fort Bangi
Lungwebungu
Tombo?
Lekumbu
Sakatongo
Kamgogo
Mosakanare
Chiumeka
Mbuatamba
Chiu
Mussango
Source of the Kwando 12° 59' S.
18° 57' E. acc. to S. Pinto
Luchai
Lucomba
Munanko
Chambambo
Molembo
Kasonjo
Lukoke lugakonga
Mumbeleto
L. Lukwiz
Kawangu
Kawungu
Inariko
Masumdas
Luiagu
Yngongola
Lubilo
12° 12' S, 19° 27' E. acc. to S. Pinto
VALUCHASE
BACHIOKWE
ACHIOKWE

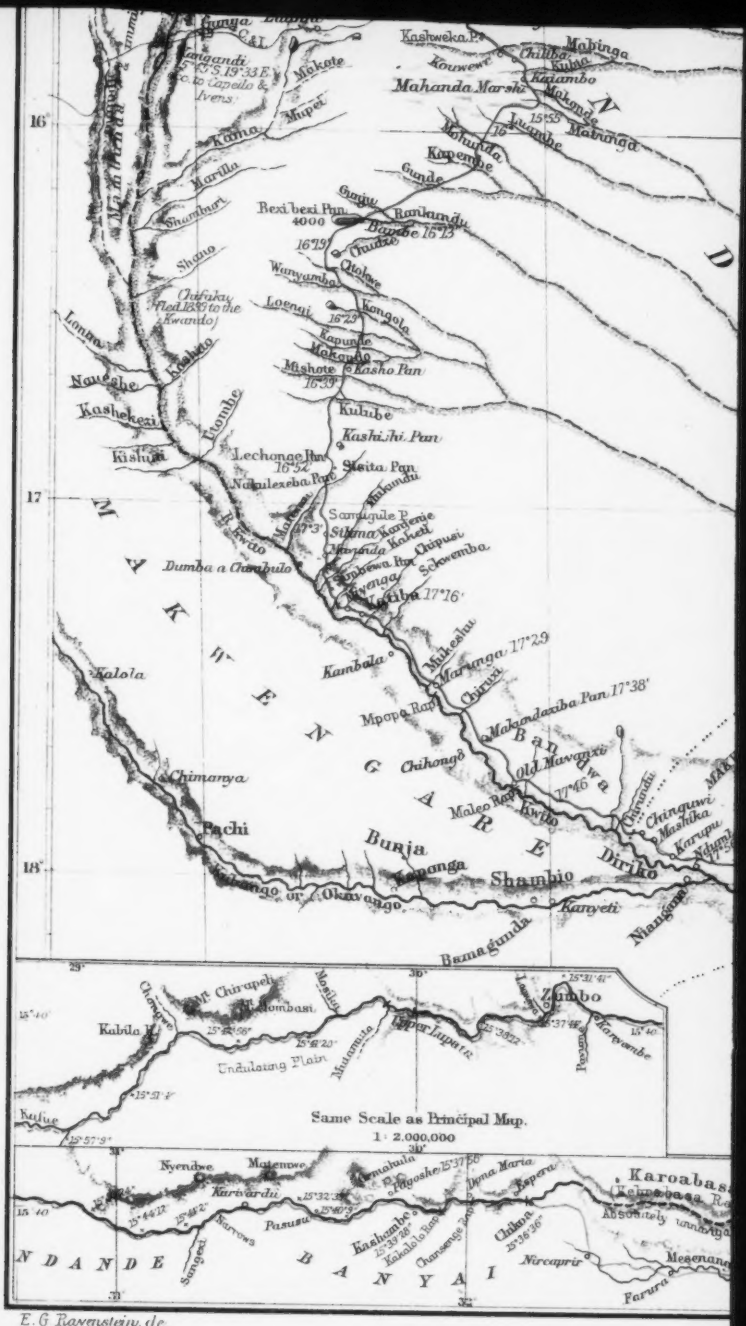

21°
22°
23
24
Mbua Kalende 4100
Livingstone
Kalende
Lasai or Loko
Kalende (18
Cameron
Quache
Chusi
Nachosi
Kavingo
Chongo
Kalunda
Kalunga Kamave
(Port. Fort 1835)
Kakenge or Kinyama
in 1851
Luwaloji
L. Magwa
Hakema
Kifumajo
Luena
Kalengi 3600
Hapuka Rap
Lungonia
Mwanza
Lumbala
Kamuseke
Mushangwandungu
Lupemba
Kapako
Kalzimina
Kasenowe
Sapuna Cat.
Liabilap
Kaikorwe
Kampewa
Chunga
Mbunda
Mpuri
Mai Kakesta
Kalumbo
Gerose Rap
Yamaiango H.
Bengila
Saloisho H.
Monakadze H.
Shinte (185 m)
Chibulezi
Chibuluma
Lutuse (Lotisi)
Lepumgwe Rap
Lunate
Sakawoya
Mukoku
Chicke
Nungulea
Sousa Mulapa
Kazumbi
Kellipa 11°59
Piri Hills
Nyakaumba
Sakwamba
Diambula
Kulingongo
Pozo
Kapupi
Seiro Makuma
Kinchikuma
Nuumula
Mwiakasi 11°32
Mosheti 4600
Kasewi 4700
Yarry
Kalonga
Alaba
Kalonga
Chinanga
Mkalengi 11°10
Mkakumbo
Mkaiemana
Mt Makoro
Makumba
Zambezi Source
11°21 3600
Kasala
Kapakoso
Lioya
Kamugesa
Lova
Kaiandu
Kangalo
Arnot
Lungwebungu
Kisenga
Susinama
Nyukatoro (Napakandindu)
Kovungu
Port. Fort
Quendende
Lutembwa
Lutembwa
Kalema (Kalombolo)
Mokumba
Okalunda
Lemaire
Shiamakesa
Katolo
Luweshi
Chimanli
Lutembwa
L. Dilolo 3600
Kalema (1853)
Angula
Olohuka
Ololieno
Nakawesama
Kalunga Kamave
Kalunda
Kalonga
Kalonga
Kalonga


25°
26°
27°
28°
29°
11°
12°
13°
Reference.
The Explorations of Major Gibbons and his Associates form the Basis of this Map, and the numerous Latitudes determined by these Explorers have been inserted upon it. Kazungula, which according to a recent Observation by Mr. Reid, lies in Long. 25° 11' E. retains the position adopted on the Royal Geographical Society's "Map of Eastern Equatorial Africa," published in 1881.
Lialui is placed in Long. 23° 11' E., this being the mean of the Astronomical Observations made by Livingstone, Serpa Pinto, and Cappelo and Ivens, and in agreement with Major Gibbons' plotted Routes.
The Routes of other Explorers, including those of Mr G. Grey of the "Tanganyika Concession Company," and of the "Rhodesia Concessions Expedition," 1897-8 (marked R.C.E.) have been added.
MALUNDA
WAKAÜNDI
BAAMBA
Mt. Mukdo
Kikia Buta
Chinambe 475
Mushima
Kalumbwana Mt.
Takatataka
Ntenke 11°22'
Mikungu 3800
Mikinga H.
Katanga 11°16'
Kapwale H.
Midiashe H.
Chinanka
Kechaba 11°33'
Kafua Source (Grey) 4400
Mt. Mbibangwe
Nailo (Lualaba)
Kwanamabala
Pambele L.
Kwandu R.
Mt. Luansinba
Chafukama Mt.
Mt. Suka
Kasonji
Kafubwa
Grey
Kanzinga ka Lundo
Kafitwa
Kapila
Mlongo
Gopera
Lunga
Kwa Ngundo
Mambunda
Musanga or Kabila 3700
Makoya
Luteka Sawalala 12°53'
Mumbeshe
Muhimo
Kabompo
Luwombo
Luoza 4200
Fomaxi
Kungulazi
Lima Nthlowo
Mushishima
Kafue
Kambo
Kasako
Fundamile
Dilanda
Mwapi
Mpunda
Chilumila
Kponda
Mbilombila
Luena
Lukangwe
Masakasi H.
Kanyolobe Reef
Mapira 3900
Kanyolobe
Lumimona 3800
Malambako
Chiwala
Kawoi (Kaboyo)
Kawoi (Old Vill.)
Msakamono
Chisifungola
Namsera
Lunga
Msakanya
Chiwala 4100
Kancha
Itabwa H.
Mpundo
Kafubufuta
Kafue Pk
Kalera H.
Lufubo
Lambulu
Shulumba
Munyoshi
Lukuluba
Loombe
Lukulubwa
Kamani
Mukuidam
Kapende
Lualaba
Grey
R.C.E.
C. & I.
J. Thomson
Fwembe 10°58'
Mwambwe
Kibubama
Kabanda H.
3700
11°49'

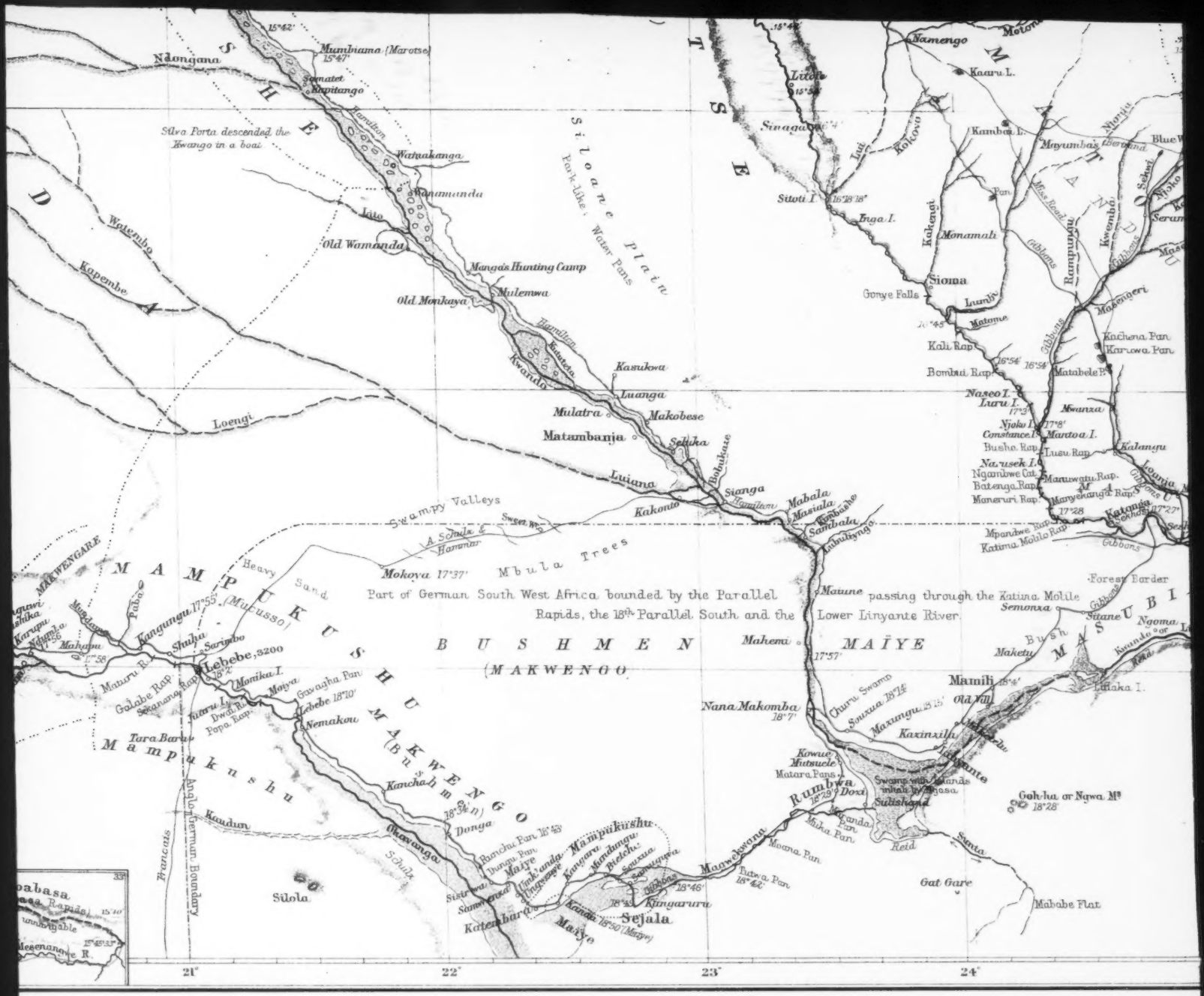

12°12'S, 19°27'E acc. to S. Pinto
Gunda
Mramba
Kangamba
Katanga Tom
(Mabunda)
S. Pinto
Kabungulu
Kiengi
Limbongo
Mambobo
Lekambe
Matolo
Kalamuno
Kalamuno
Mumbwa 14°40'
Litoteta
Kumasa
Chipopa
Kalembe
Somwa, 14°53'
Chato
Kaumbwa, 14°56'
Kalonga
Mangenda
Changeria
Makora
Chombimba
Kibaba
Donga
Kuelo
Sampoka
Mandungu 15°20'
Kaxubo
Sangambu
Chipoka
Mungamba
Konshubia
Kutiye
Kaiungwa
Kau
Chilemba
15°35'
Chipopa Rap.
Lomba
3900
Chachinge
Kashweka
Mabinga
Kulua
Kaiungu
Kwembo (Kambo)
Kwando
Silva Porto
Lupire
Kafilo
Kwando
Lomba
Luanja
Kuito
Kwando
Kwembo
Kwando
Kwando
Kwando

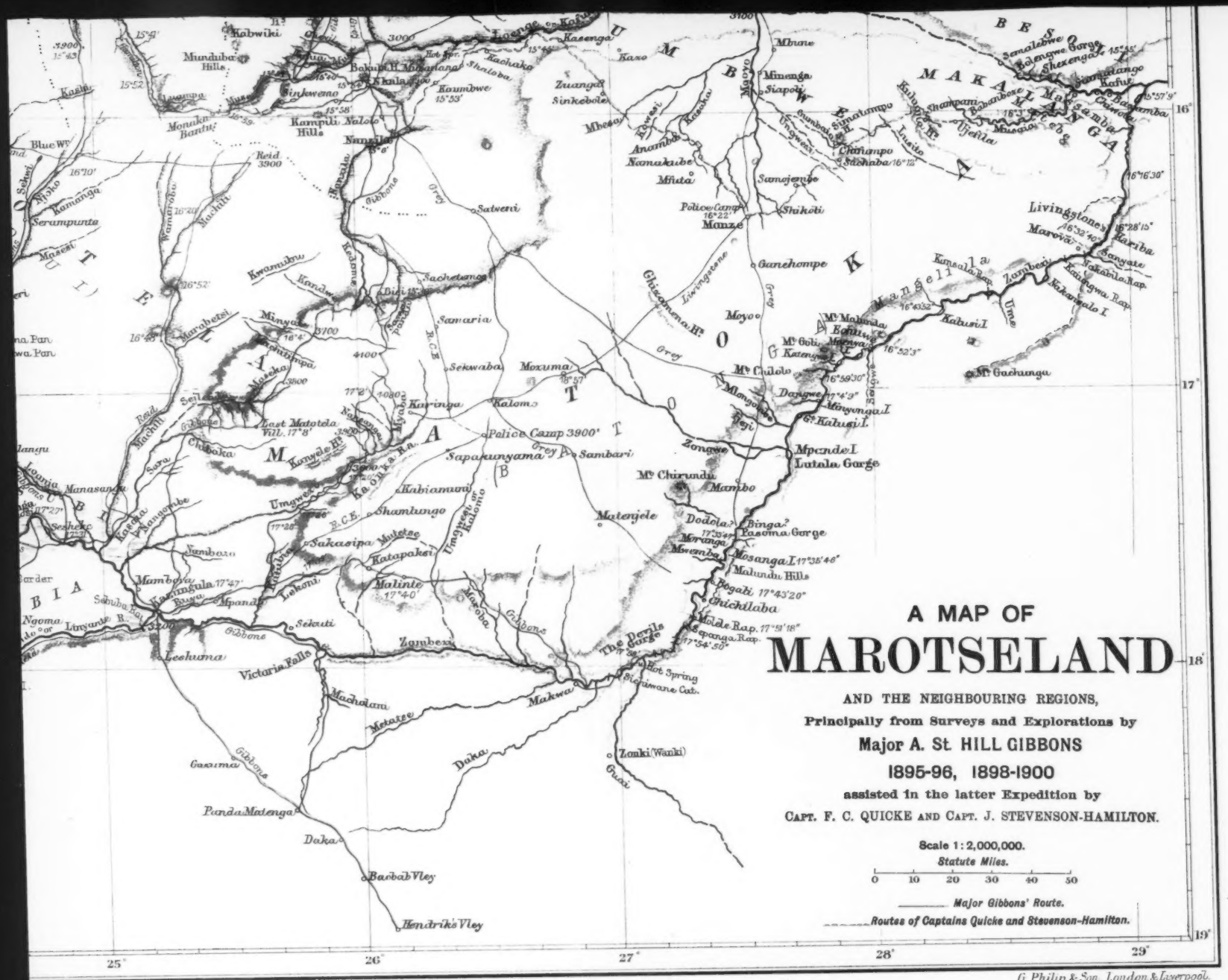

Gimbo
(Mambunda)
Kandumbwe
(Malobale)
Liandamhi
(Simyama.)
Ingulu
Malobale
Liwua Plain
Broad Plain
Marshy
L. Osoro
Sewisha
Tobola (Marotse)
Mumbiama (Marotse)
Yamaianga H.
Serangila
Kasembwe
Sapuma Cat.
Ruskorwe
Runkuni Rap.
Kamgowa
Chawaia
Makondo
Latembo
Kalabula
Kakolo
Mwanawale Rap.
Sepumbangombe
Mulongoseka
Kasalanga
Zongwe
Kabompo
Namboma Rap.
Sunda
Mbale
Chimuika
Serota
Wamba
Nyoyo
Sungo
Sambo I.
Lioti
Maunga
Mandi
Marunga
Namambo I.
Namafupa I.
Matende
Lubunda
Sikoa
Lisuna
Mbelibi
Mwamba
Maioka
Musa Bango
Sekokwa
Lealui
Nalolo
Mangango
Mwendi
Mwandi
Shiriba
Namengo
Motondo
Kashamba
Lumolwa
Kwandi
Kamanga
Kanyonyo
Kanyonga
Mainene
Mutya Pan
Kapui
Dima
Lomba
Banda
Kaunga
Kangulu
Mulai
Sha Kuambio
Malala
Kolombeo
Kalonga
Kyengo
Kema
Mokuse
Tobola
Wamenda
Rumwai
Kalaba
Libonta
Sekote
Mashokwe
Pandamasuka
Mapopa
Nawembwe
Mwandela
Litamo
Lifebu
Komutuma
Mashewa
Sirundulu Pan
Kul Pan
Mutango Pan
Mutanusona
Mwandi
Nanjekwa Pan
Roandwe Pan
Nyonge P.
Semonge
Nalele
Boyela I.
Sekile
Mwiwe Pan
Mwanga
Mutondo
Mwanga
Mwanga
Mwanga

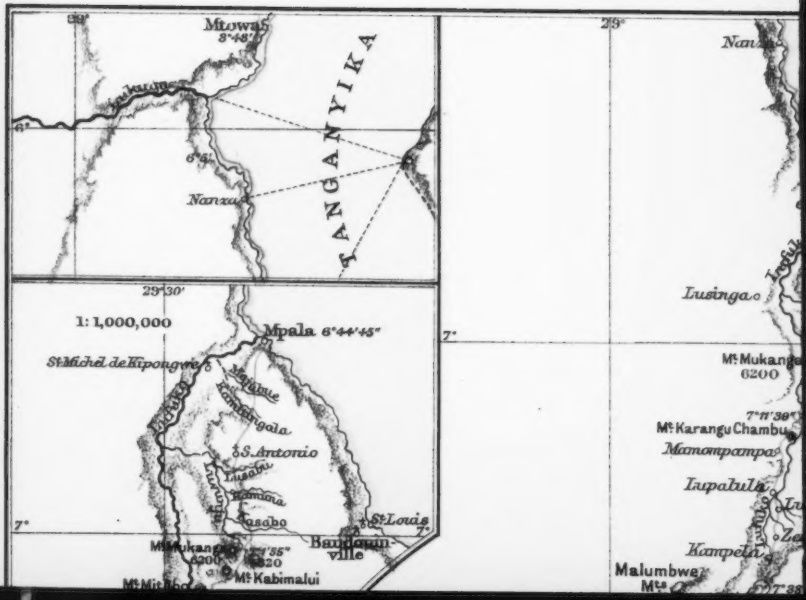

Kabompo
Luwombo
Luoza 4200
Fomasi
Kungulazi
Sinoti
Kalawangonji 4200
Dongwi
Taba Kabompa 4600
Kalule 4000
Luiadambo
Sikaba
Lumbi
Kakamembi
Meakeaka 13°50'
Avoitair
Roto 14°4'
14°16'
Dulumina
14°28
Masekwa
Chera
14°40'
Musima
Sekola
Kabulwebulwe, 3500
Rapids
Malowe (Mulua)
Rapids
Mokoba (Serba)
14°58
Chakinka
Moinachigmi
15°41'
Tatamolilo
Sampango
Lukutu Mts
Source
Lofoshia
Sebalwe
Mosiku Hs
Kanyunga
Simulwe
Mongalesa
Namalubiki Hs
Kalwiki
Munduba
Lofoshia
Mwanza
Gibbons
Rowetts
Malambwi
Edzumbe
Unakompa
Lubanda
Lonka
Lofoshia
3000
Lofoshia or Kafukwe or Kayuni
Kasenga
Lima Nthlowo
Mushikuma
Source
Ulilu
Mfwashi
Kundimina or Kasempa
4100 13°20
Kalule
Pongu
Luangu
Kalasa 3700
Kafue
Swamps
Lukanga
Sitanda
Kasonsa
Lukanga
Kamwenda or Siedi
Ponawi
Balesa
Malambika
Chikama
R.C.B.
Antarasha
3600
Lukanga
Green
Manakulile
Calobe
Chepepo
3700
Makeshi
Chepepo's Old Vill.
J. Thomson
Kitango
Mairi (old Stn.)
3700
Kitakata
Mutepele
Mairi
Munga
3700
Malwa
J. Thomson
Machilambe
Bambuela
3800
Malundu Hs
Mulungushe
Lunsemfwa
Moltimba
Chiberombe
Kalolo
Chiwundi
Nkanka H.
Chilenga
Mahule H.
Kembe
Mungulo
Mitanko Hs
Luili Hs
Unsambula Pk
Lombamasina Pk
Mtinti Hs
Chiba
Munga
Mpusi
Longo
Kabundashi
Nalubamba
Mabulau
Mulembo
2000
Lubu
Sikatende
Mwanga
Ntumiga
3100
Mbune
Luembe
Shukumbwe
Kapulaman
Sekoma
Shangu
Shimaponde
Shibumba
3600
Nchete
Gusela
Chomba
Mulito
Lutete
Chikokomanu Mts
Unde Unde
3700 ft
Sikolomo
Gasemba
Luimba
Nyalabe
Chanzoneu
Gasobe
Shangai Mts
K. Kermosa
Pararmoto
2400
Luteta
Mfutama
Mahulu
Kwombosi
Mutama
Chaimba
Kalumbanga
Balesa
Chikango
Luangobi
Chapea
Luampesi
Boloma
Mairi
4100
Kafulufuta
Mt. Ungara
Nkonga Pk
Motundo
Itabwa Hs
Kasenga Hs
Kichipa
Lumpuma
3600
Malambaka
Lufoyi Luyana
Kancha
Chikuse Hs
Kalumbanga
Green
Lukanga
Green
Manakulile
Lupanga
Mts
C.M.S.
Mairi (old Stn.)
3700
Kitango
Chepepo's Old Vill.
J. Thomson
URENJE

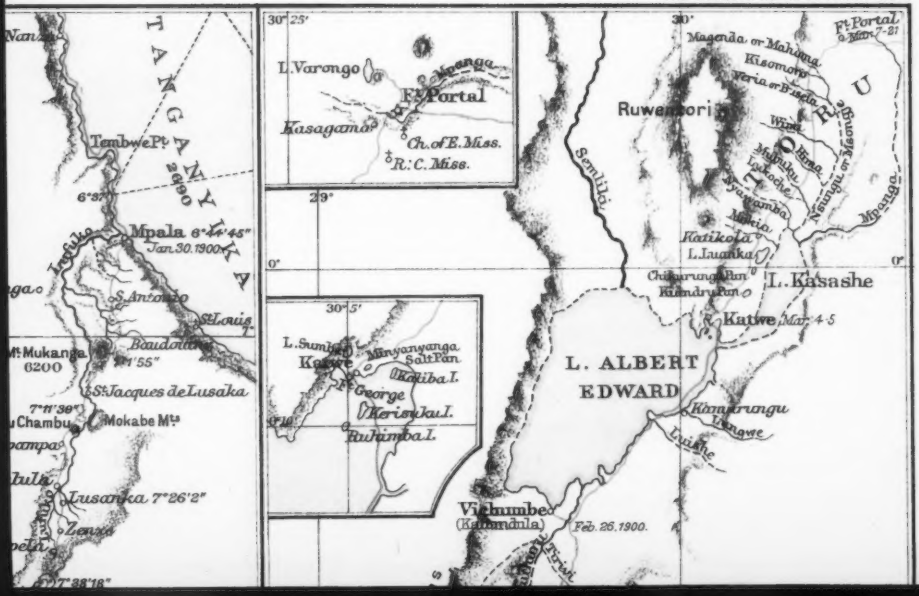


E. G. Ravenstein. de

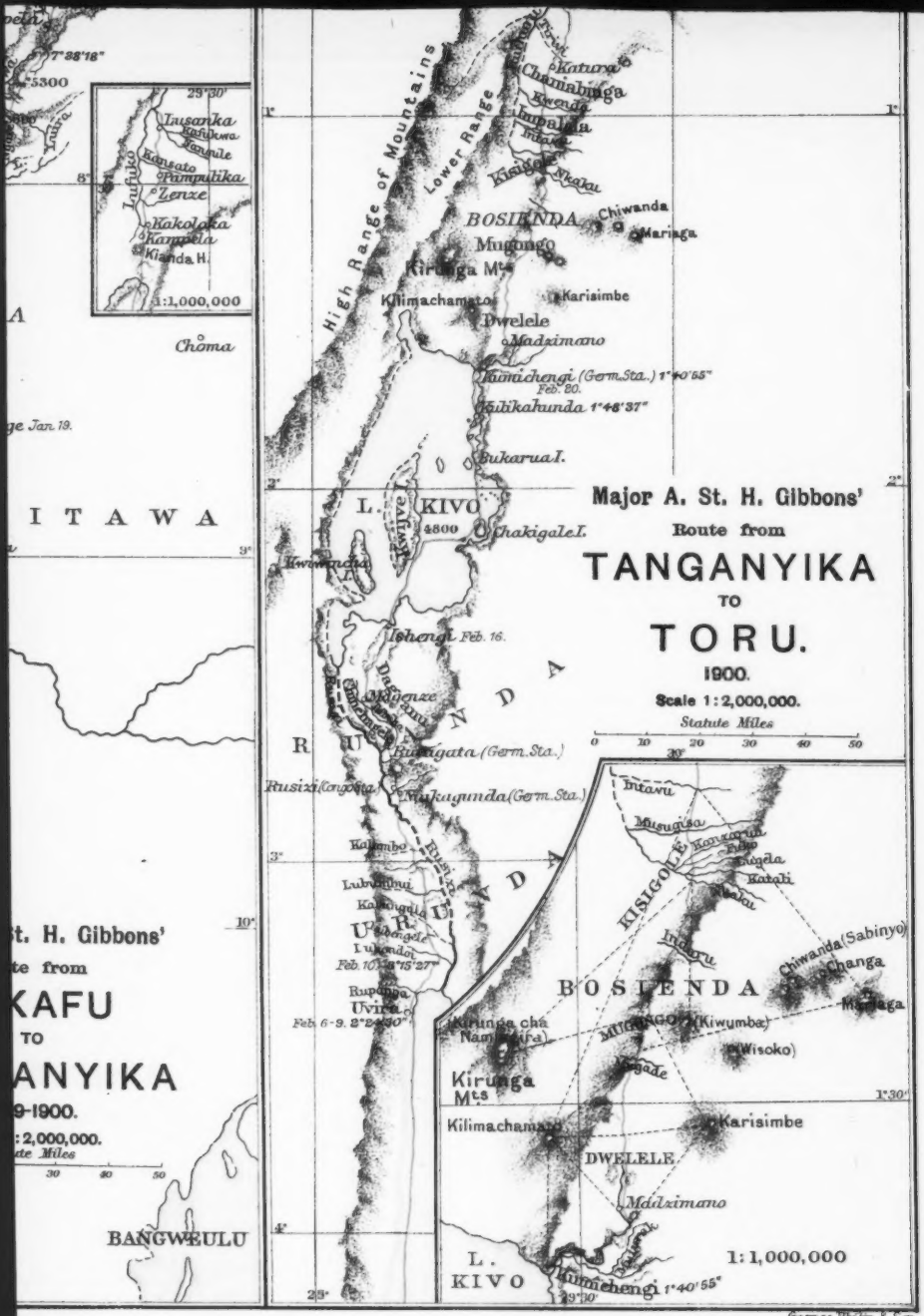

Part of German South West Africa bounded by the Parallel of 17°30' passing through the Katima Molile Rapids, the 18th Parallel South and the Lower Linyante River.
Ndongana
Mumbuana (Marotse)
Samatet Kapitango
Silva Porta descended the Kwango in a boat
Watnakanga
Wamanda
Lito
Old Wamanda
Manga's Hunting Camp
Mulemwa
Old Monikaya
Kasukwa
Luanga
Mulatra
Makobese
Matambanja
Seluka
Luiana
Sianga
Mokoya 17°37'
Kakonto
Swampy Valleys
Mbula Trees
Heavy Sand
Forest Border
Mahena
Maune
Lebebe, 3200
Monika I.
Gavanha Pan
Nemakau
Kangungu 17°55'
Shuha
Sarimbo
Mahamu
Mamuru R.
Galabe Rap.
Sekanana Rap.
Juaru I.
Dwa R.
Papa Rap.
Tora Baru
Mampukushu
Makwengo
Bushmen
Maiye
Nana Makomba 18°7'
Churu Swamp
Souxua 18°15'
Maxungu 18°25'
Kaxinxilu
Kowue
Mutsucle
Matara Pans
Rumbwa 18°29'
Dora
Sukshand
Mamili 18°4'
Old Mamili
Lilaka I.
Gah-ha or Ngwa Mo 18°28'
Kaudun
Okavanga
Donga
Ranchu Pan
Maiye
Mampukushu
Kangaru
Mandumgu
Bietchu
Souxua
Sambungwa
Kingaruru
Sejala
Katembara
Maiyo
Sisitwa
Sambungwa
Kaima 18°50' (Mayo)
Manwelwana
Moana Pan
Tatwa Pan 18°42'
Reid
Santa
Gat Gare
Mahabe Flat
Sulola
Francais
Schultz
Anglo-German Boundary
Kwando
Linyante
Sitoti I.
Inga I.
Siwaqua
Litoa
Kaaru I.
Namengo
Kamba I.
Mayumba
Kakanai
Monamah
Sioma
Gonye Falls
Luumbi
Matome
Kali Rap.
Bombai Rap.
Matabele P.
Naseco I.
Izaru I.
Njoku I.
Constance I.
Martoa I.
Bushe Rap.
Luau Rap.
Narusek I.
Ngambwe Cat.
Batenga Rap.
Maneruri Rap.
Maruwatu Rap.
Maryekanga Rap.
Katonga
Mpandwe Rap.
Katima Molile Rap.
Semonza
Situane
Maketu
Kachena Pan
Kariowa Pan
Matabele P.
Mwanza
Kalangu
Loumia
Ngoma
Kwando
Linyante
Sikololo
Sesheke
Loengi
Kapembe
Wawembo
Lui
Kolovo
Kwando
Linyante
Sikololo
Sesheke
Mashi
Kwembe
Rampungu
Gibbons
Mashongeri
Schori
Njoko
Serum
Blue W
Mayumba
Liambezi


A MAP OF
MAROTSELAND
AND THE NEIGHBOURING REGIONS,
Principally from Surveys and Explorations by
Major A. St. HILL GIBBONS
1895-96, 1898-1900
assisted in the latter Expedition by
CAPT. F. C. QUICKE AND CAPT. J. STEVENSON-HAMILTON.
Scale 1: 2,000,000.
Statute Miles.
0 10 20 30 40 50
Major Gibbons' Route.
Routes of Captains Quicke and Stevenson-Hamilton.
Victoria Falls
The Devils Gorge
Zambesi
Leeluma
Sekuti
Livingstone
Kazungula
Kalomo
Sinkeweno
Kampili Hills
Mundubai Hills
Kabwiki
Nanzila
Monze
Shiboti
Ganehompe
Mpande I.
Lutola Gorge
Mosanga I.
Malundu Hills
Pogabi
Chichilaba
Molde Rap.
Sepanga Rap.
Zonki (Wanki)
Barbab Vley
Hendriks Vley
Panda Matenga
Daka
Gasuma
Machalana
Metatee
Makwa
Hot Spring
Sichuwane Cab.
Sakasipa
Katapaksi
Malinte
Mamboya
Kamungula
Shamlungo
Kahiamani
Sapakunyama
Sambari
Police Camp 3900'
Last Matotela Vill. 17°8'
Chiboka
Kanyele R.
Kaonka Ra.
Sesheke
Manasanga
Sefula
Mongu
Lealui
Kalabo
Libonta
Mbwela
Mbunda
Mbowe
Mbwela
Mbwela
Mbwela


Mtowa 8°48'
TANGANYIKA
6°
6°45'
Nanza
29°30'
1: 1,000,000
Mpala 6°44'45"
St. Michel de Kipongwe
Mayidue
Kamongala
S. Antonio
Lusabu
Kamina
Kasebo
St. Louis
7°
Baudouinville
Mt. Mukanga 6200
Mt. Kabimalui
29°
Nanza
Lusinga
Mt. Mukanga 6200
7°11'39"
Mt. Karangu Chambua
Mamompampa
Lupalula
Kampelu
Malumbwe
Mt.


TANGANYIKA
Tembwe Pt
6°37'
Mpala 6°44'45"
Jan. 30. 1900
S. Antonio
St. Louis
Mt Mukanga 6200
Boudouin
St. Jacques de Lusaka
Chambu
Mokabe Mts
Lusanka 7°26'2"
Zenza
30°25'
L. Varongo
Ft. Portal
Kasagama
Ch. of E. Miss.
R. C. Miss.
29°
30°5'
L. Sumbi
Kasiru
Minyanyanga
Salt Pan
Kaliba I.
George
Kerinyaku I.
Ruhimba I.
30°
Maganda or Mahuma
Kisomoro
Veria or Busiga
Ruwenzori
Wimi
Mubuku
Lamia
Nyamwamba
Mawingu or Mgongo
Mpanga
Katikola
L. Lusanka
Chibwirungu Pan
Kiandru Pan
L. Kasashe
Kative Mar. 4-5
L. ALBERT EDWARD
Kimpwirungu
Usinge
Lulahe
Vichumbe (Kimandula)
Feb. 26. 1900.
Semliki
Ft. Portal
Mar. 7-21

Kampelu
Malumbwe
Mts
Mt Kabimalui
Mt Mit Loo
St Jacques de Lusaka
Mokabe Mts
Mt Karangu Chambu
Manompampa
Shialamala
Lufira
Luapula
N. Ndumbu R.
L. Lualeshwa R.
Kalela
Gwena
3460
BAWEMBA
Mpwetu
Mpwetu Jan. 18.
Chipungu
Chienge Jan.
Luanda
Wehera
Lukosolwa
Luaba
Matunda
Piria Hills
3630
Kamakola
Gela
Rhodesia
Kalonga
Kebunzeo
Malango
Kasete
Kawanga
Kilwa I.
Molanga 9°17'13"
Jan. 13.
Kabesa
Pamabula (Calumbo)
Chikole
Kamirongi
Katuta
Luwanga
Lufukwe
Kabuba
Katuna
Katufia
Mamaula
Kazembe
Kunde Lungu Range
MWERU
LUNDA
3000
Lufira
Lualala
Mwenda
Kabimbi
Kansenshesa
Lufubu
Tambu
Lufoi
5500
Mikunulu
Mukulu
Mande
Matubesia (Matandabantu)
Lukafu
3260
K. Kapwashe R.
M. Mwena R.
L. Lualesha R.
Ka. Kafumaluma R.
Mo. Molungu R.
Mluashia 10°43'52"
Dec. 19. 1899
Wambe
Fwambo 10°58'5" Dec. 17. 1899
Major A. St. H.
Route fro
LUKAF
TO
TANGAN
1899-1900
Scale 1:2,000,
Statute Mile
0 10 20 30
Published by the Ro



the Royal Geographical Society.